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Four approaches to assessing the potential for asbestos exposure in schools were evaluated: (1) a proposed exposure-ranking system or algorithm, (2) bulk sampling and analysis of the asbestos-containing materials, (3) a measurement of stimulated fiber release, and (4) air sampling. The scoring consistency was evaluated for the factors in the algorithm; friability and activity was scored with the least consistency, and exposure and the presence of air-moving systems with the most consistency. Scoring consistency improved with rater training. The variability in the determination of asbestos content was found to be associated with the laboratory analysis more so than with the sampling process. False negatives were found to occur, even at asbestos levels greater than 10 percent. The potential for release of fibers by physical disturbance of the asbestos-containing material was demonstrated with the use of a vibrator in contact with ceilings in schools; the releasability was found to increase with asbestos content and friability. Only a limited effort was devoted to air sampling, it was done for short periods (1 hour), and the analyses were done by phase microscopy (which detects only the fibers longer than 5 microns with an aspect ratio greater than 3:1). The air-borne fiber levels were less than 0.07 fibers/cc in all cases but one.

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ASBESTOS IN SCHOOLS

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EXECUTIVE SUMMARY

The objective of this study was to evaluate four approaches to assessing the potential for asbestos exposure in schools: (1) a proposed exposure-ranking system or algorithm, (2) bulk sampling and analysis of the asbestos-containing materials, (3) measurement of stimulated fiber release, and (4) air sampling. Only a limited amount of effort was devoted to air sampling.

Use of the proposed algorithm involves visual inspections of sites in schools, and assignment of scores to seven factors (condition of the asbestos-containing material, its accessibility, its friability, the extent of any water damage, the fraction of the material exposed, the presence of an air plenum or direct-air stream, and the amount of activity in the area). If the rating form used in scoring the various factors in the algorithm is to be useful as a measurement tool, the precision of the form must be improved as much as possible. The data from the study suggest that training of the raters in the use of the form improved the scoring consistency. With more intensive training than the 4-hour session used in this study, additional improvement might result. The factors which were scored with the least consistency, even with training, were friability and activity. Exposure and the presence of an air-moving system were scored with the most consistency. With untrained raters, an expansion and improvement of the rating form did not result in improved scoring consistency. Neither form may be meaningful to untrained raters.

An additional factor in the algorithm, percentage of asbestos present, is scored by obtaining bulk samples of the material and analyzing them in the laboratory. A study of the variability associated with the bulk sampling was performed by obtaining samples from four locations in each of eight 5000 ft^2 areas of apparently homogeneous ceiling material. Each of the samples was split into four fractions prior to analysis to yield information in the variability associated with the analytical procedure. The variability associated with the laboratory analysis was found to be the major contributing factor to the total variation, and the variance was found to be related to the asbestos content. The variability associated with sampling at different locations in a 5000 ft^2 area was small in comparison. This suggests that it might be sufficient to obtain one sample of each ceiling of interest and perform replicate analyses on that sample; however, the problem of false negatives makes that procedure questionable. False negatives were found to occur, even at asbestos levels greater than 10 percent. Procurement of multiple samples of each ceiling is thus the recommended procedure.

The potential for release of fibers by physical disturbance of the asbestos-containing materials was demonstrated with the use of a vibrator in contact with ceilings in schools.

These measurements of stimulated fiber release demonstrated that the asbestos content and friability were the primary factors influencing fiber releasability. The releasability, as determined by the vibrator technique, was found to increase with the asbestos content and with friability. Attempts to relate the releasability to other algorithm factors and multiples of factors did not reveal anything.

Since the population of materials which have the greatest potential for fiber release are those which have a high asbestos content and high friability, they should be the ones to receive the most attention in an asbestos-control program. The friability scores, in general, were found to increase with the asbestos content, at least for the materials examined in this study. Thus any low friability score assigned to a material with a high asbestos content should be viewed with suspicion though there can be exceptions (such as cementitious materials). The scores for condition of materials were not found to be related to either asbestos content or friability, but any asbestos containing material which is badly damaged should probably be dealt with.

Limited air sampling was performed in schools during periods of normal activity, and no relationship was found between the airborne fiber levels for fibers longer than 5 microns with an aspect ratio greater than 3:1 (OSHA fibers) and the exposure scores computed from the algorithm. This is not surprising since the algorithm is intended to be a measure of potential exposures and not current exposures, and since the airborne fiber levels were found to be low (less than 0.07 fibers/cc in all cases but one). Continuous monitoring of airborne fiber levels at a few sites yielded a limited amount of evidence that release of fibers into the air,either by reentrainment or by fiber release from asbestos-containing materials, is an intermittent process. An experiment to determine if sweeping floors increases airborne fiber levels was not conclusive

ASBESTOS IN SCHOOLS

1. INTRODUCTION AND OBJECTIVES

The presence of asbestos in building materials found in schools (and other buildings) is a potentially serious problem for the large numbers of students, teachers, and support personnel who may be exposed to the asbestos. As part of the EPA program to deal with this problem, an assessment of the potential for asbestos exposure in a school is required. The overall objective of the study discussed in this report was to evaluate four methods for making this assessment:

- An exposure ranking system
- Bulk sampling
- Stimulated fiber release
- Air sampling.

The study was conducted in two phases. The first phase served to identify problems and provide the information needed for planning the more definitive study conducted in the second phase.

An exposure ranking system, or algorithm, was proposed by EPA (USEPA 1979a). The algorithm places numerical values on conditions found in a building or an area of a building. The items or factors which are scored in the application of the algorithm are condition of the asbestos-containing material, its accessibility, its friability, the extent of water damage to the material, the fraction of the material exposed, the presence of an air plenum or direct air stream, and the amount of activity or movement in the area (USEPA 1979b). An additional key factor is the percentage of asbestos present in the material, as determined from laboratory analysis of a bulk sample. Each factor is assigned a value according to a predetermined weighting system. These values are combined in the algorithm to yield an exposure number which is used as an indicator of potential asbestos exposure problems. Comparison of the exposure number to a preestablished scale would indicate what control, if any, is appropriate.

A major issue in the application of the algorithm is the consistency of the scoring of the various factors by different raters. One objective of this study was to assess that consistency for groups of both trained and untrained raters.

The initial step in assessment of the potential for exposure to asbestos is the determination of the presence of asbestos in the suspect material. This is done by obtaining one bulk sample from each 5000 sq ft of area and analyzing it by polarized light microscopy (USEPA 1979b). An objective of the study reported here was to determine the variability associated with the collection of samples from a 5000-sq ft area, and with the analysis performed by a single laboratory. (Interlaboratory comparisons were not part of this study.) The percentage asbestos is one factor employed in the algorithm; so variability of the bulk sampling is a factor in the consistency of scoring the algorithm. The percentage asbestos is also potentially an independent measure of the potential for exposure to asbestos. Thus another objective of this study was to assess the degree to which the bulk sampling results can serve as a measure of the exposure potential.

The airborne fiber levels in a building's airspace are related to a number of processes including mechanisms for fiber release and fiber reentrainment. A recent study by Sebastien, et al. (Sebastien, et al. 1979 and 1980) documents the importance of the reentrainment process and the influence of human activity in the airspace under consideration on fiber levels once fibers have been released. The third portion of this study addressed the identification of the factors of importance in predicting fiber release as evidenced by fiber levels resulting from a simulated disturbance. As a starting point the study investigated the relationship of simulated fiber release levels to algorithm scores, realizing that the algorithm was designed to be an indicator of the potential for an asbestos exposure and not a measure of an immediate airborne asbestos problem. As originally structured, the algorithm attempted to assess simultaneously the potential for both fiber release and for fiber entrainment. The present study simulated a disturbance to the surface of different asbestos-containing materials with a vibrator and monitored the fiber fallout as a measure of the potential releasability of asbestos. The relationship of these vibrator results to pertinent algorithm factor scores was investigated.

The fourth potential measure of asbestos exposure potential is the determination of airborne OSHA* fiber levels by air sampling. An objective of this study was to measure airborne fiber levels in schools and to investigate the relationship to algorithm scores. A strong relationship was not anticipated, for the algorithm was designed to be an indicator of the potential for release of asbestos and not an indicator of an immediate airborne asbestos problem. Even if a strong relationship were observed, it could not be interpreted as a validation of the algorithm. The relationship would only demonstrate that the algorithm satisfactorily identifies current ambient fiber levels. Only a limited amount of air sampling was done, and the bulk of the samples were analyzed by phase microscopy which only determines fibers longer than 5 microns with an aspect ratio greater than 3:1 (OSHA fibers). A few samples were analyzed by transmission electron microscopy to determine the smaller fibers.

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* Occupational Safety and Health Administration

2. DATA COLLECTION

To accomplish the objectives of this study, field sampling was conducted in midwestern and southern schools. The choice of sampling sites was based on the concept of a factorial experimental design modified to comply with the realities of the sampling situation. In an ideal environment, sites would be selected from the sampling frame (listing of available sites) in such a way as to include rooms that conform to all possible combinations of the characteristics being studied. For example, if the characteristics being investigated are five algorithm factors and if each factor is scored at two levels, then an experiment that would contain information to independently evaluate the importance of each factor would require $2^n=2^5$ or 32 sites. Additionally, each of the sites would be required to reflect the physical conditions associated with one of the 32 combinations.

Strict adherence to such an experimental design was not possible for this study. First, the sampling frame of sites where asbestos is present is not defined. Secondly, sites described by every combination of algorithm factors are not certain to exist. Finally, after appropriate sampling sites were identified, the cooperation of building administrators had to be secured before sampling within a building could begin.

Working within these constraints, 64 sites were chosen for sampling, 18 in Phase I and 46 in Phase II. Sites were selected that conform to various combinations of two algorithm factors, friability and condition. These two factors were selected to define a modified design table because both factors are thought to significantly effect the level of asbestos exposure. In addition, both factors can be visually evaluated.

The rating forms used for scoring the factors in the algorithm are provided in Appendix A.

Table 1 shows the 3 x 4 design table that results from the cross-classification of condition with friability. In each cell of the table is the number of sites sampled that were assigned to the cell by Battelle raters. The table indicates that a variety of sites were sampled. However, sites containing highly friable material were difficult to locate, and only one such site was included in the study. No sites were found that correspond to a condition score of 3 and a friability score of 1. This situation, a non-friable material that is in poor condition, probably does not occur often.

TABLE 1. SAMPLING DESIGN

		FRIABILITY			
		1	2	3	4
CONDITION	1	2	3	10	
	2	5	12	5	1
	3		10	16	

The 64 sites chosen for sampling are located in 22 school buildings. The data collected at each site are organized by building and presented in APPENDIX B. At each site four types of data were collected:

- Rating-form data
- Bulk-sampling data
- Stimulated-fiber-release data
- Air-sampling data.

2.1. Rating-Form Data

The exposure ranking system proposed by EPA (in consultation with Dr. Robert N. Sawyer of Yale University) is one method for measuring the potential hazard associated with the presence of asbestos in a room. The ranking system consists of eight factors. Seven of the factors are assigned scores based on a visual inspection of the site being evaluated. These seven factors are: condition, accessibility, friability, air moving system, exposure, water damage, and activity. The eighth factor is the measure of the percentage of asbestos present as determined from analysis of bulk samples of the material in question. The eight factors are combined according to a predefined rule or algorithm to provide a summary exposure score, or exposure number, which is an indicator of potential asbestos exposure problems. The algorithm for computing the summary exposure score is presented in Appendix A.

The consistency of scoring is an inherent problem of any rating form used in scoring the factors. If a form is to serve as a measurement device, evaluations of a site by several raters using the form should produce similar results. The form, however, is a subjective measurement tool, and consistency among raters using the form is not guaranteed.

In this study, data were collected with two rating forms to evaluate the consistency of scoring. Initially, in Phase I, a condensed form was used. Because preliminary analysis of the data collected with this form showed inconsistent scoring among raters, a revised rating form was developed, and both forms were used for the remainder of the data collection. The condensed form includes an introductory paragraph and brief descriptions of the factors to be scored. On this form the term "integrity" is substituted for the term "friability" in the hope that it is a more precise term. The revised form provides additional information about the factors to be scored and incorporates photographs into the factor descriptors. The term "friability" is reinstated on the revised form. Both forms are reproduced in Appendix A.

In a program to evaluate hazard due to asbestos exposure, a variety of people could be responsible for scoring the rating form. Two groups identified as possible raters are school administrators and individuals trained in the use of the rating form. In the collection of data, individuals from both groups were asked to evaluate sites using the rating form. In addition, one or two Battelle raters scored the form at each sampling site. In coding the data, the types of raters scoring a site were designated numbers as follows:

1: Battelle rater using revised rating form
(the same rater at all sites)
2: School administrator using revised rating form
3: Trained rater using revised rating form
4: School administrator using condensed form
5: Battelle rater using condensed form.

This coding scheme is employed in presentation of data in Appendix B.

Currently few people are trained in the use of the rating form. To serve in the capacity of trained raters, five graduate students studying in the Education Administration Department at Ohio State University were employed. These students were used to represent school personnel, for it was not practical to train actual school personnel and move them from school to school. A 4-hour training session was held to introduce the graduate students to the asbestos project and to instruct them in the scoring of the rating form. The agenda for the training session was:

I. Introduction
   A. Objectives of the project
   B. The potential for asbestos exposure
II. The Rating Form
   A. Factor definitions presented in the rating form
   B. Extended definitions using photographs and slides
   C. Practice scoring of the rating form using photographs and slides.

Group discussion was encouraged throughout the training session. After attending the session the five graduate students were taken to sampling sites where they individually evaluated the rooms using the rating form.

2.2. Bulk-Sampling Data

During field sampling for the asbestos study, bulk samples of ceiling materials were collected at 64 sampling sites located in 22 school buildings. Bulk samples were taken at each site to estimate the percentage of asbestos present at the site and determine a score for factor eight of the rating form. The bulk samples were analyzed by Polarized Light Microscopy as described in Appendix C. The analyses were performed blind by the analyst, i.e., the samples were coded and he did not know the true sample numbers. The results of the laboratory analysis of bulk samples are presented in Appendix B.

Additionally, thorough bulk sampling was done at eight sites to investigate the variability associated with the bulk-sampling procedure. The eight sampling sites chosen for this purpose are Sites 15-3, 16-1, 18-1, 19-1, 21-1, 23-1, 24-1, and 25-1. At each of these sites there is a 5000 ft^2 area of apparently homogeneous ceiling material. From each 5000 ft^2 area four samples of ceiling material were taken at four randomly selected locations. Each of the four samples were evenly divided by hand into four individual film canisters, resulting in sixteen film canisters of ceiling material for each of the eight 5000 ft^2 areas. These data are analyzed to estimate the variance components associated with the bulk-sampling procedure.

2.3. Fiber-Releasability Data

To obtain a measure of the releasability of asbestos from different asbestos-containing materials in the schools, a modified scripto vibrator was used to agitate the surface of the materials (ceilings in all cases). A schematic drawing of the vibrator agitation system is given in Figure 1. The vibrator marking tool was modified by mounting a flat disk, 1 inch in diameter, on the tip of the vibrator. The vibrator was housed in an enclosed canister, 6-1/4 inches in diameter and 10-1/4 inches in height, which served as the sampling chamber. The chamber was placed against the ceiling in the same manner each time to ensure that the angle of contact of the ceiling by the disk was the same each time. The vibrator was spring-loaded in order to maintain a constant pressure against the ceiling. The vibrator frequency was set at the beginning of the research and not changed, in order to maintain the same energy input to all ceilings.

Particulates released into the air in the chamber during agitation were sampled by drawing the air through a sampling tube into a collection filter system identical to that used in normal air sampling. Make-up air was admitted to the chamber through a Millipore filter. The fiber concentration in the chamber was determined by phase contrast microscopy (PM) of the 47-mm, 0.45-μm pore size Millipore filter from the collection system. In Phase I, the air in the chamber was also sampled with a Fibrous Aerosol Monitor (FAM), but this was discontinued in Phase II. This portable instrument manufactured by the GCA Corporation of Bedford, Massachusetts, operates on a light-scattering principle, and it does not distinguish between asbestos and other fibers. It records fiber counts for periods of 1, 10, 100, or 1000 minutes, and automatically converts the counts to concentrations, in units of fibers per cm^3, which are read from a digital meter. At fiber concentrations above about 15 fibers per cm^3 it is necessary to correct the FAM readings for coincidence losses, and fiber concentrations considerably higher than this were observed in Phase I. Thus the FAM was not considered to be useful for subsequent vibrator air sampling.

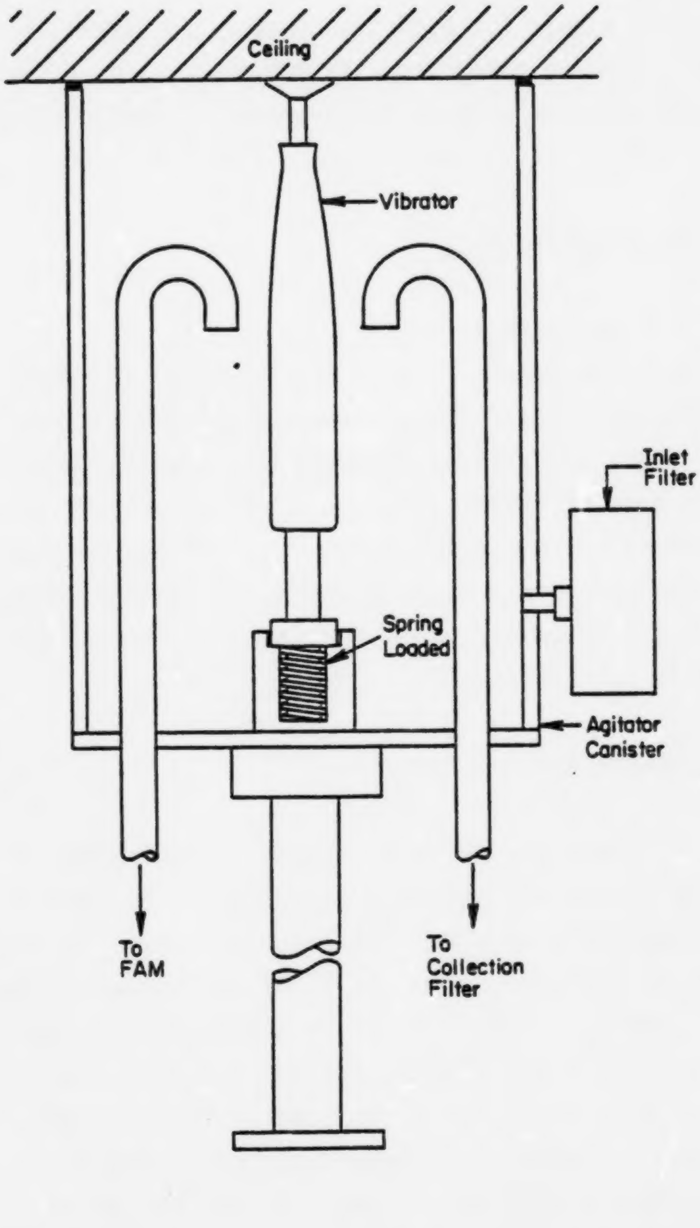

Ceiling
Vibrator
Inlet Filter
Spring Loaded
Agitator Canister
To FAM
To Collection Filter

FIGURE 1. SCHEMATIC OF VIBRATOR AGITATION SYSTEM

In the first two buildings sampled, three consecutive 10-minute FAM readings were taken while a 30-minute Millipore sample was collected. This was found to be too long a sampling time, for the filter deposits were too dense for analysis. Thus, in subsequent work the sampling time was reduced to 1 minute for both techniques, and several consecutive samples were taken. Prior to taking any samples the air was pumped from the chamber for 1 minute after turning on the vibrator, in order to clear the particulate-free air from the tubing.

2.4. Air-Sampling Data

Two techniques were used in this study for the determination of airborne fiber levels. The primary method involved collection of the fibers on Millipore filters which were subsequently analyzed by PM. A few selected filters were analyzed by transmission electron microscopy (TEM) to confirm the presence of asbestos fibers. The second technique involved on-site measurements with the FAM manufactured by GCA Corporation. These techniques were employed in air sampling during periods of normal activity in the schools and in an experiment involving air sampling during sweeping of the floors in one building.

2.4.1 Normal Air Sampling

Different protocols for air sampling during normal activity were followed in the two phases of this study. In Phase I, airborne fiber levels were measured at 18 sites in 6 schools by both techniques, the FAM and collection on filters. Since the fiber levels were found to be low in the Phase I work, air sampling during normal activity was not emphasized in Phase II. In Phase II, only the FAM was used, and then just as a spot check of fiber levels at a few sites. At five sites in Phase II the FAM was used in a continuous recording mode to record the fiber levels over long periods (up to 16.7 hours). To monitor airborne levels of short (less than 5 microns) fibers, TEM analyses are required. Due to the high cost of TEM analyses and the existence of such data gathered by Sebastien, et al. (Sebastien, et al. 1979 and 1980), only a few selected samples were analyzed by TEM.

A schematic diagram of the sampling system used for collection of airborne particulates (including fibers) on filters is shown in Figure 2. The filters used were 47-mm, 0.45-μm pore size, mixed cellulose ester membrane (Millipore) filters. A capped, open-face filter configuration was used. The sampling flow rate was 28.3 ℓ/min., and the sampling time was 1 hr. At three of the six buildings sampled, outdoor ambient air samples were also obtained. The filters were analyzed by PM as described in Appendix C. For a 1-hr sampling period, the detection limit is 0.006 fibers per cm^3. Since the PM technique does not distinguish between asbestos and other fibers and does not measure fibers shorter than 5 microns, selected samples of interest were also analyzed by TEM. The TEM procedure is also described in Appendix C.

An analysis of the variability associated with the PM and TEM procedures is given in Appendix D.

FAM was used for on-site measurements of airborne fiber levels. In this study, 10-minute readings were taken. The flow rate through the FAM counting chamber is 2 ℓ/min, and fibers in 0.5 percent of this volume are counted; so the detection limit for a 10-minute count is 0.01 fibers per cm^3.

The FAM was also used in conjunction with a strip-chart recorder to obtain a trace of the cumulative fiber count over time. This was done for periods of up to 1000 minutes (16.7 hours) in Phase II in an effort to observe intermittent releases of fibers into the air in selected school rooms.

2.4.2. Air Sampling During Sweeping

An experiment was conducted to determine if the act of sweeping floors increased airborne fiber levels. Three sites were studied, one that contained no asbestos and two which did. The first sampling site (Number 12-1) was the entrance hallway at the school having a ceiling material which

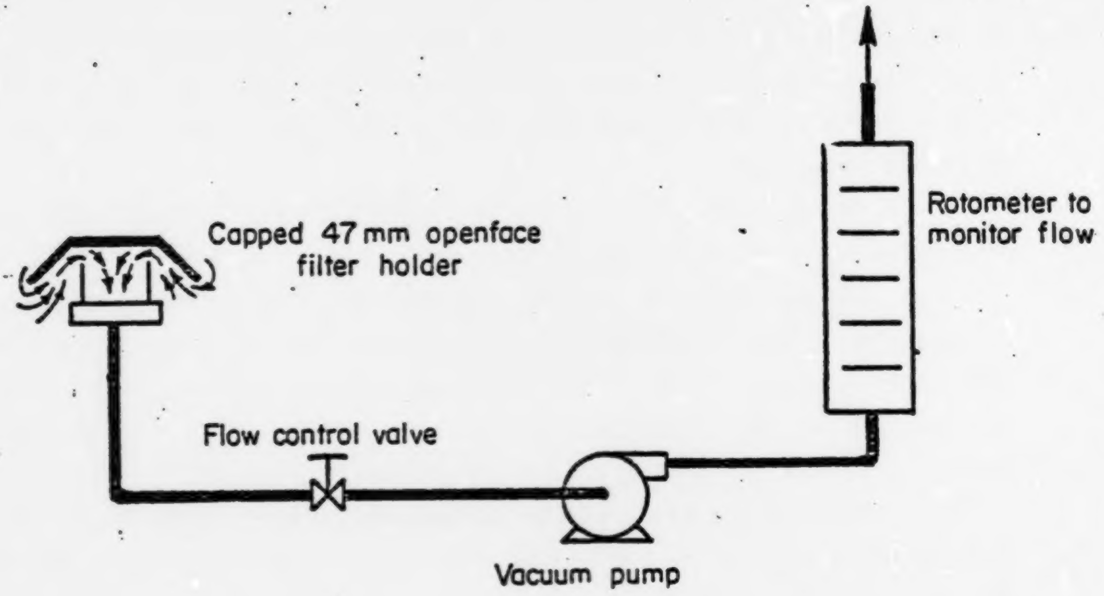

Capped 47 mm openface filter holder
Rotometer to monitor flow
Flow control valve
Vacuum pump

FIGURE 2. SCHEMATIC OF SAMPLING SYSTEM

appeared to be plaster. The hall appeared to have been thoroughly cleaned. The wooden floors were shining, and no dust had accumulated. The second site (13-1) was a hallway on the first floor of a school, and it was in very bad condition. The ceiling material was hanging in pieces, and when sunlight shined into the hall the air looked dirty. The floor had been wet mopped several hours before sampling began, but it was still dusty and muddy. The third site (13-2) was a classroom on the second floor of the same building as Site 13-1. The ceiling in this room was in much better condition than the ceiling in the hall downstairs. The room looked clean, but the floor was slightly dusty.

Air samples were taken in the two asbestos-containing sites prior to the sweeping experiment, and ambient air samples were taken outdoors. In addition, wipe samples were taken from various surfaces in all three sites to obtain an indication of the presence of fibers. The wipes were analyzed by PM. The results merely indicate the presence of fibers on the floors and other surfaces, and they are not quantitative measures which can be compared with each other

The protocol for the sweeping experiment was as follows. Sixty-minute air samples were collected on a filter while a Battelle employee swept the floor of the hall. Ten-minute FAM readings were also taken. The FAM and the collection filter were placed side by side in the middle of the hall, and the sweeper swept at varying distances from the sampling equipment as explained below. The sweeper also wore a personnel monitor that housed a collection filter.

First 10-minute period: sweeping done greater than 3 meters from sampling equipment, and FAM placed on a table 3-1/2 feet high.

Second 10-minute period: sweeping done greater than 1 meter but less than 3 meters from equipment, and FAM placed on table.

Third 10-minute period: sweeping done within 1 meter of equipment, and FAM on table.

Fourth 10-minute period: sweeping done greater than 3 meters from equipment, and FAM placed on the floor.

Fifth 10-minute period: sweeping done greater than 1 meter but less than 3 meters from equipment, and FAM placed on the floor.

Sixth 10-minute period: sweeping done within 1 meter of the equipment, and FAM placed on the floor.

The filter samples and the personnel monitor samples were analyzed by PM. Selected samples were analyzed by TEM to confirm the presence of asbestos.

3. INTERNAL-CONSISTENCY STUDY

For the rating form to be a useful measurement tool, the form must produce consistent results when scored by various raters. Scoring consistency is affected by many factors, two of which were investigated in this study. First, the effect of rater training on scoring consistency was examined by comparing the consistency among trained raters using the revised form to the consistency among untrained raters using the revised form. Secondly, the effect of scoring a more detailed rating form (the revised form) rather than a condensed form (the original form) was examined. The scores of untrained raters were used to make this comparison. In addition to studying factors that affect scoring consistency, the amount of variation observed in exposure scores was summarized.

Scoring consistency was evaluated for each rating form factor individually. The seven factors studied were condition, accessibility, friability, air-moving system, exposure, water damage, and activity. The eighth factor, percent of asbestos present, was not included because it is not scored by raters, but determined by laboratory analysis. The variability associated with the determination of asbestos content is discussed in the Bulk Sampling Section of this report.

The scoring consistency of each factor was measured as two quantities: (1) consistency among raters' scores for a site, and (2) agreement of scores with the true physical conditions at a site. These two quantities are not explicitly defined. Rather, the definitions of these quantities are determined by the statistics chosen to measure them. A variety of statistics could be used, and each statistic would produce a different definition of internal consistency or agreement with truth. The two statistics used in this study were chosen to provide reasonable definitions of the two variables of interest.

Internal consistency among raters was measured with a statistic D that is the average size of the disagreement among raters weighted by the percentage of disagreement observed. The agreement of factor scores with the true physical conditions at the sites was measured with a statistic V. V is the average of the differences between the rater scores and the true score. The scoring of sites by one Battelle rater was taken as the true evaluation of sites. Because the scale used by raters was the scale being evaluated for consistency, unweighted rather than weighted factor scores were used in the calculation of D and V statistics. The mathematical formulations of D and V and a discussion of the two statistics are presented in Appendix E.

3.1. The Effect of Rater Training on Scoring Consistency

Improved scoring consistency might be achieved by training raters in the use of the rating form. To investigate this theory, rating-form data were collected at 27 sampling sites from untrained school administrators using the revised form and from trained raters using the revised form. Using D and V statistics, the scoring consistency of the two groups was compared.

At each site and for each factor, D values were calculated from the scores of the untrained raters and from the scores of the trained raters. These values are presented in Table B-5 of Appendix B. The Wilcoxon Signed Rank Test (see Appendix E) was used to test the hypothesis of no training effect on internal consistency (as measured by D). In the Wilcoxon procedure, the D values of the two rater groups at each site are compared, and the comparison information is summarized over all sites. The hypothesis test was performed for each of the seven rating-form factors, and the results appear in Table 2.

Also in Table 2 are results based on V values. At each site and for each factor, V values were calculated from the scores of the untrained raters and from the scores of the trained raters. The V values are presented in Table B-6. These values were compared, using the Wilcoxon statistic, to test the hypothesis of no training effect on rater agreement with truth (as measured by V). The results are presented in Table 2.

Training may have improved the scoring consistency of the condition factor and the exposure factor. Trained raters also show improved internal consistency when scoring friability, but they seem to agree less with the true friability scores than do the untrained raters. Trained raters may score water damage less consistently, but there is little evidence of a difference in the consistency of the two rater groups when scoring the remaining factors.

TABLE 2. SCORING CONSISTENCY OF TRAINED RATERS COMPARED TO UNTRAINED SCHOOL ADMINISTRATORS, BOTH USING THE REVISED FORM

Factor	Comparison Based on D Values	Comparison Based on V Values
Condition	more consistency among trained raters	more consistency among trained raters
Accessibility	no evidence of a difference in scoring consistency between the two groups	no evidence of a difference in scoring consistency between the two groups
Friability	more consistency among trained raters	less consistency among trained raters
Air Moving System	no evidence of a difference in scoring consistency between the two groups	no evidence of a difference in scoring consistency between the two groups
Exposure	more consistency among trained raters	more consistency among trained raters
Water Damage	less consistency among trained raters	no evidence of a difference in scoring consistency between the two groups
Activity	no evidence of a difference in scoring consistency between the two groups	no evidence of a difference in scoring consistency between the two groups

Trained raters using the revised form seem to score the form somewhat more consistently than untrained raters using the revised form. The evidence in favor of training is certainly not overwhelming, but with more intensive training additional improvement in scoring consistency might be observed.

3.2. Comparison of the Scoring Consistency of the Original Form and the Revised Form

The revised rating form contained improved factor descriptors, so the revised form was expected to produce more consistent results than the original form. To test this hypothesis, rating-form data were collected from untrained school administrators using the revised form, and untrained school administrators using the original form at 13 sampling sites. At each site, D statistics were computed for the administrators using the new form and for the administrators using the original form. These D values are given in Table B-7. The Wilcoxon Signed Rank Test was again used to compare the D values of the two groups at each site and to combine the comparison information over all sites. The Wilcoxon statistic tests the hypothesis of no effect, due to rating-form revision, on internal consistency (as measured by D). The results of the hypothesis tests are presented in Table 3.

In Table 3 no comparisons of original and revised rating forms are made using V statistics. The computation of V statistics requires the choice of a true score to which raters' scores can be compared. At each of the 13 sampling sites included in this analysis, the Battelle rater completed the revised rating form, so a true score is available for the revised rating form. At these sites, however, the Battelle rater did not complete the original form, so no true score is available for the original form. Consequently, V statistics for data collected with the original form cannot be computed, and the original and the revised forms cannot be compared using V values.

The results in Table 3 show that among the untrained raters there is no evidence of improved scoring consistency with the revised rating form. This does not imply, however, that the original form should be used to evaluate sites. The lack of improvement may be attributable to the lack of training of the raters scoring both forms. Neither form may be meaningful to raters

TABLE 3. SCORING CONSISTENCY OF UNTRAINED RATERS USING THE REVISED RATING FORM COMPARED TO UNTRAINED RATERS USING THE ORIGINAL RATING FORM

Factor	Comparisons Based on D Values
Condition	no evidence of a difference in scoring consistency of the two groups
Accessibility	no evidence of a difference in scoring consistency of the two groups
Friability	no evidence of a difference in scoring consistency of the two groups
Air Moving System	no evidence of a difference in scoring consistency of the two groups
Exposure	more consistency among raters using revised form
Water Damage	no evidence of a difference in scoring consistency of the two groups
Activity	less consistency among raters using revised form

not trained in its use. Previous analysis suggests that rater training may improve scoring consistency. Data collected with trained raters scoring both forms might show better consistency with the revised form, but data to substantiate this are not available in this study.

3.3. Variation in Exposure Scores

Trained raters using the revised form appear to be the raters that most consistently evaluate sites. The variation in the exposure scores of the trained raters is summarized in Table 4 and displayed graphically in Figure 3. (The weighted factor scores used in the calculations of the exposure scores are given in Table B-8). For each site, the table includes the number of raters evaluating the site and the minimum, maximum, and average exposure score observed for the site. The table also includes the coefficient of variation which expresses the variation in exposure scores for a site relative to the average exposure score for the site.

The variation in exposure scores that appears in Table 4 is due to variation in the scores of the seven factors. The variation in bulk-sampling results does not contribute to the variation shown in Table 6. The average percent of asbestos observed at a site is used to calculate the exposure scores of all raters evaluating the site. Since the same percentage is used for every rater, none of the variation among raters is attributable to the percent asbestos factor.

The summary statistics in Table 4 show the imprecision associated with the exposure-score measurement. At a given site a wide range of exposure scores can be observed. At Site 14-01 the minimum score observed is 48, and the maximum score is 108. This range might not be disturbing since all scores observed at Site 14-01 could be interpreted as "high". But discrepancies among scores also exist at lower exposure scores levels. At Site 16-02 the scores range from 26 to 64, and at Site 24-02 from 0 to 32. These values show that for a given site the exposure-score measurement can be quite variable.

The information in Table 4 also indicates that at some sites there is little variation in exposure-score calculations. At Sites 16-04, 19-02, and 20-02, for example, the estimates of average exposure score are quite precise, with coefficients of variation less than 15 percent.

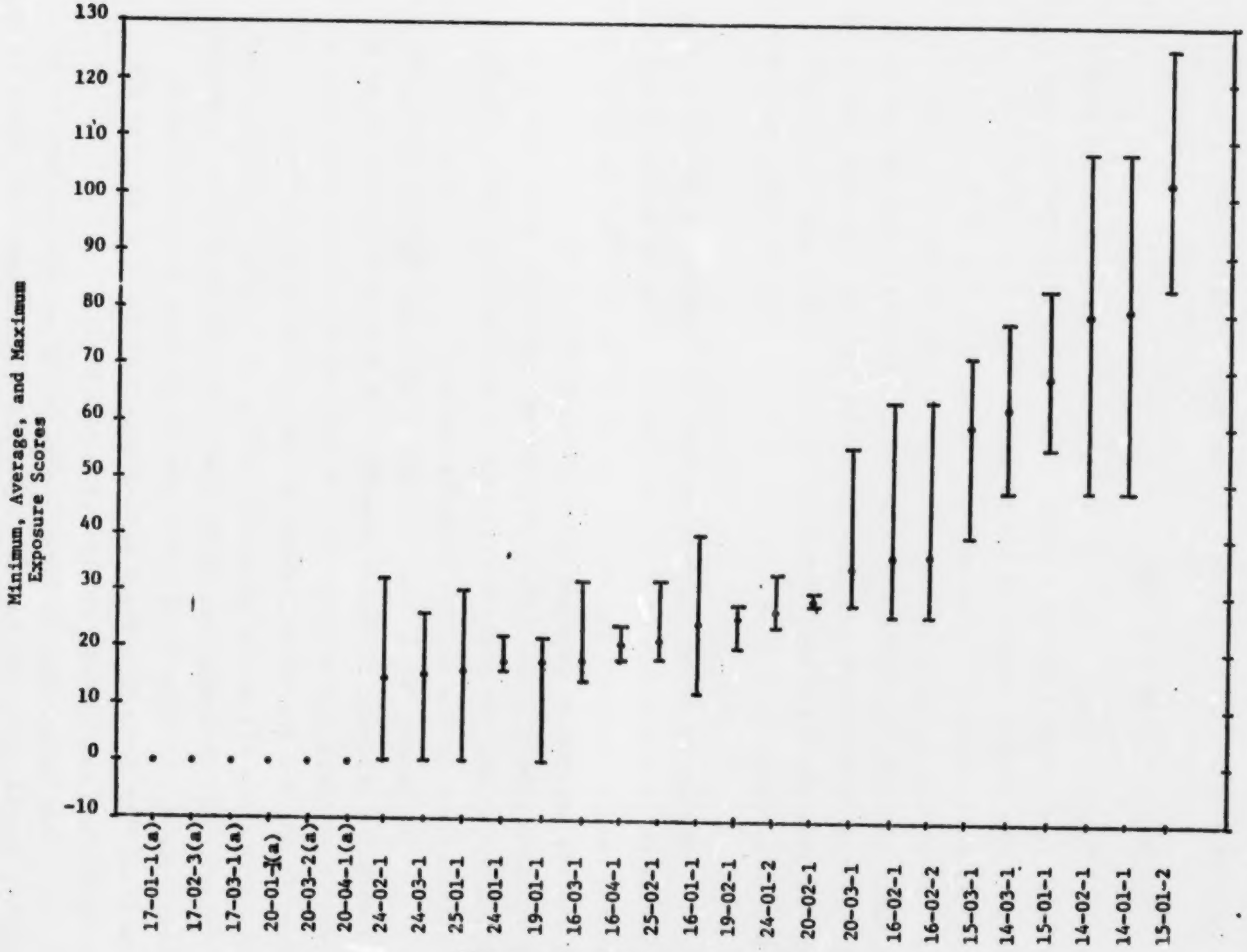


FIGURE 3 . GRAPHIC DISPLAY OF VARIATION ORBSERVED IN EXPOSURE SCORES OF TRAINED RATERS USING REVISED FORM (DATA FROM TABLE 4)

(a) Asbestos content at this site estimated to be zero.

TABLE 4. VARIATION OBSERVED IN EXPOSURE SCORES OF TRAINED RATERS USING REVISED FORM

Sampling Site Identification			Number of Raters	Minimum Exposure Score	Maximum Exposure Score	Average Exposure Score	Percent Coefficient of Variation
Building	Site	Location					
14.	1.	1.	5.	48.	108.	80.4	30.
14.	2.	1.	5.	48.	109.	79.8	30.
14.	3.	1.	5.	48.	78.	63.2	20.
15.	1.	1.	5.	56.	84.	68.8	15.
15.	1.	2.	5.	84.	126.	103.2	15.
15.	3.	1.	5.	40.	72.	59.6	20.
16.	1.	1.	5.	12.	40.	24.4	52.
16.	2.	1.	5.	26.	64.	36.4	43.
16.	2.	2.	5.	26.	64.	36.4	43.
16.	3.	1.	5.	14.	32.	18.0	44.
16.	4.	1.	5.	18.	24.	20.8	11.
17.	1.	1.	5.	0	0	0	0
17.	2.	1.	5.	0	0	0	0
17.	3.	1.	5.	0	0	0	0
19.	1.	1.	5.	0	22.	17.6	56.
19.	2.	1.	5.	20.	28.	25.6	13.
20.	1.	1.	5.	0	0	0	0
20.	2.	1.	5.	28.	30.	28.4	3.
20.	3.	1.	5.	28.	56.	34.4	35.
20.	3.	2.	5.	0	0	0	0
20.	4.	1.	5.	0	0	0	0
24.	1.	1.	5.	16.	22.	17.6	15.
24.	1.	2.	5.	24.	33.	26.4	15.
24.	2.	1.	5.	0	32.	14.4	98.
24.	3.	1.	5.	0	26.	15.6	91.
25.	1.	1.	5.	0	28.	16.4	62.
25.	2.	1.	5.	18.	32.	21.6	28.

The variability of exposure scores could be decreased by identifying the factors that contribute most to the variability. Once identified, these factors could be modified to improve precision of scoring, or the factors could be eliminated from the calculation of exposure score.

The data collected from trained raters were analyzed to determine which of the seven factors show the least internal-scoring consistency (as measured by D). D statistics were computed for each factor at each site using trained-rater data, and the D values are presented in Table B-5. Friedman's nonparametric two-way layout (see Appendix E) is applied to the D values. In Friedman's procedure, the seven D values at each site are ranked from least to greatest. Friedman's statistic is based on factor ranks averaged over all sites. The statistic is referred to tabled values of a chi-square distribution to test the hypothesis that the internal consistencies of the seven factors are qual. The hypothesis is strongly rejected by the data. Based on the average ranks of the factors, the ordering of factors from most internal consistency to least internal consistency is:

1. Air-Moving System
   and
   Exposure
3. Water Damage
4. Condition
5. Accessibility
6. Friability
7. Activity.

The data collected from trained raters were also analyzed to determine which of the seven factors show the least agreement with truth (as measured by V). V statistics computed for each factor at each site are presented in Table B-6. Friedman's procedure was used to test the hypothesis of equal agreement with truth for the seven factors, and the hypothesis was strongly rejected. Based on the average ranks of the factors, the ordering of factors from most agreement with truth to least agreement with truth is:

1. Exposure
2. Air-Moving System
3. Accessibility
4. Condition
5. Water Damage
6. Friability
7. Activity.

Among the seven factors, friability and activity are the factors that are scored least consistently. Several courses of action could be taken to compensate for the inconsistency of these two factors. The factors descriptors might be improved, although the attempt with the revised rating form was not successful. The friability and activity factors might be weighted less heavily than the more consistent factors in the exposure-score algorithm. Finally, friability and activity might be eliminated from the calculation of exposure score.

3.4. Summary

If the rating form is to be used as a measurement tool, the precision of the form must be improved as much as possible. The data suggest that the 4-hour training session used in this study improved the scoring consistency of raters. With more intensive training, additional improvement in scoring consistency might result. Table 4 shows that at given sites the variation in exposure scores of trained raters is large. Friability and activity are identified as the factors that contribute most to exposure-score variability and that consequently need attention.

4. BULK SAMPLING

The objective of the bulk-sampling study was to determine the variability associated with the collection and analysis of samples from individual 5000 sq ft areas in schools. Toward this objective, the relationship between the variance of the measure of asbestos content and the mean percent of asbestos present were studied. If the variance is related to the mean, then the precision of the bulk-sampling procedure can be expected to differ across ceilings that contain various amounts of asbestos. Two components of variance, the variation due to sampling location within a ceiling and the variation due to laboratory procedure, were estimated. The components of variance analysis indicate which source contributes more to the total variation associated with bulk sampling and suggest guidelines for sampling from a 5000 sq ft area. Additionally, the variation in bulk-sampling results expressed as asbestos present or asbestos absent is summarized. The data show that analysis of multiple samples collected from a site can produce both asbestos positive and asbestos negative results. For this reason, the recommendation is to always collect multiple samples from a material suspected of containing asbestos.

4.1. Mean/Variance Relationship

Basic data summaries indicate that the variability associated with the determination of asbestos content in a material appears to be related to the average amount of asbestos present in the material. Sample variances are plotted against sample means for the subset of data from the eight sampling sites in Figure 4. In Figure 5 sample variances are plotted against sample means for data collected at the 46 sites sampled during Phase II of the study.

Figure 4 shows a strong positive relationship between the S_i^2 and the $\overline{X}_{i}.$ when the amount of asbestos present is less than approximately 30 percent. The point corresponding to the 49 percent level of asbestos content may be an outlier or may be an indication that at higher levels of asbestos content the relationship between the variance and the mean is different than seen in Figure 4.

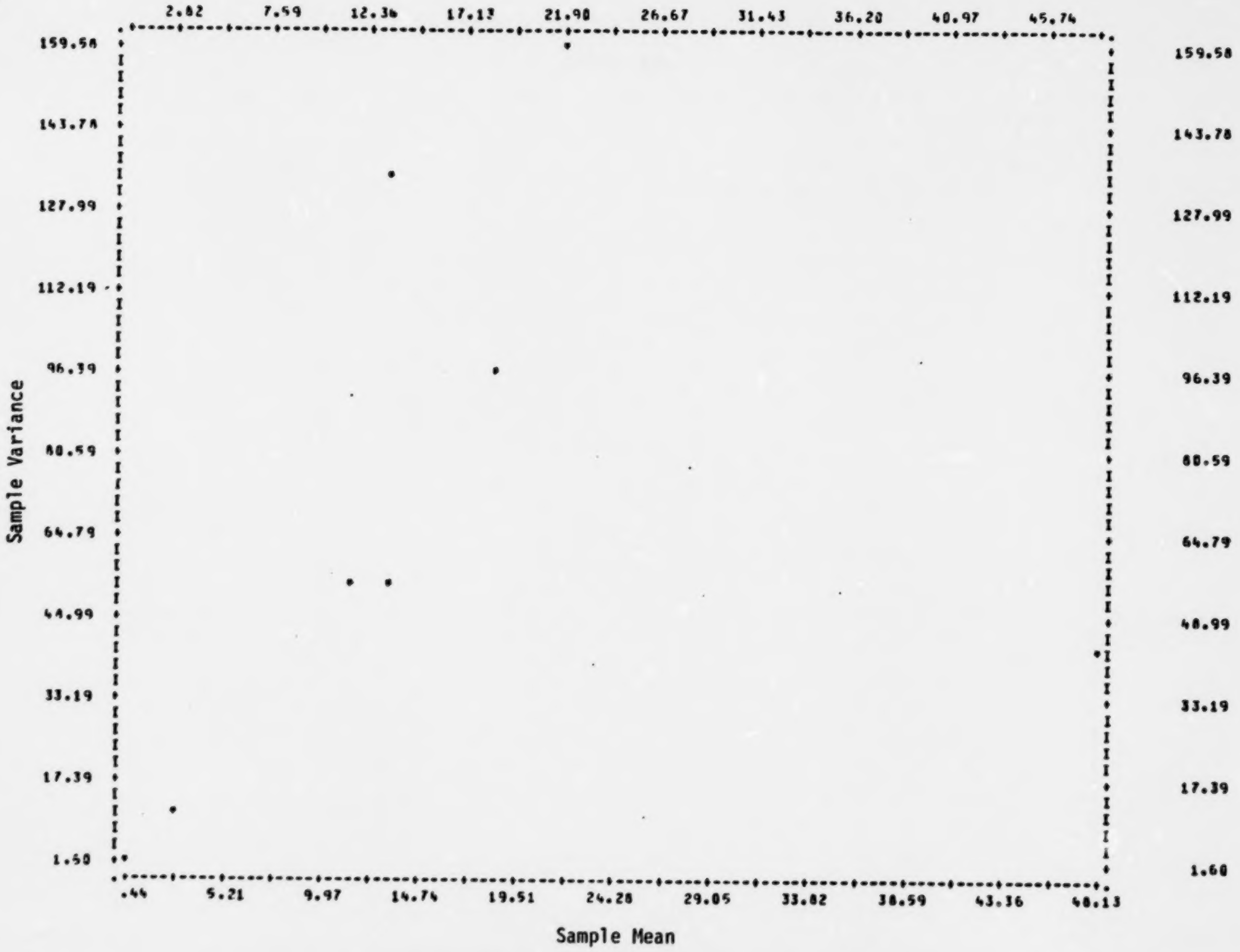


FIGURE 4. DATA FROM EIGHT SAMPLING SITES

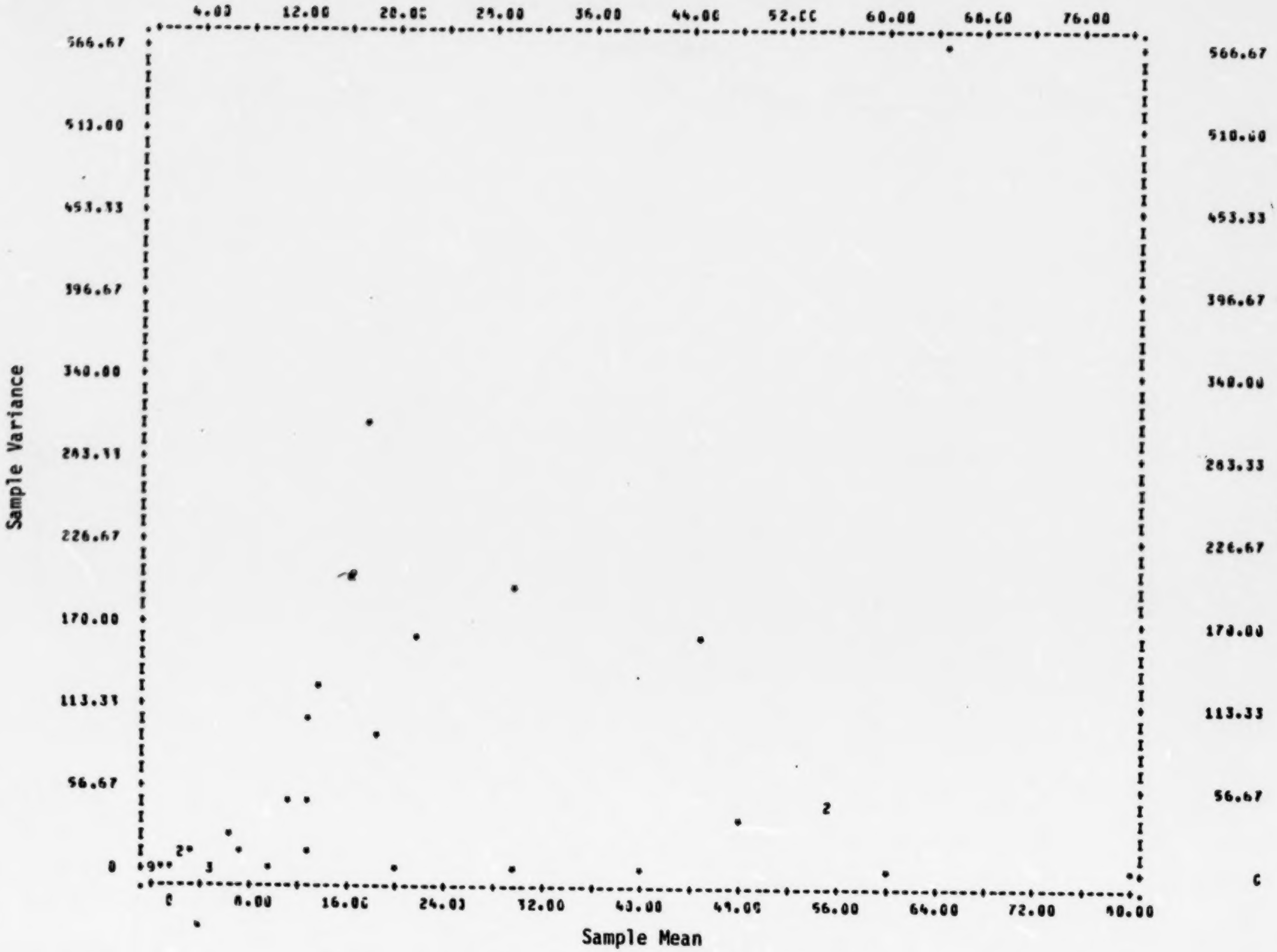


FIGURE 5. DATA FROM 40 SAMPLING SITES

The data in Figure 5 show a change in trend at higher levels of asbestos content. If the data points corresponding to zero variance are ignored because they are based on small numbers of observations that produced identical results, the data in Figure 5 show an increasing trend for samples containing less than 30 percent asbestos. The samples containing higher levels of asbestos do not conform to the trend.

The point with sample variance equal to 557 appears to be an outlier. This point corresponds to Site 15-1, and the laboratory records show that four samples were collected at this site, two from water-damaged locations and two from undamaged locations. Laboratory analysis of the four samples produced these results:

Sampling Site ID Number	Percent of Asbestos in Bulk Samples from Water-Damaged Locations	Percent of Asbestos in Bulk Samples from Undamaged Locations
15-1	80; 90	40; 50

The laboratory results are similar for the two bulk samples collected from water-damaged locations and for the two bulk samples collected from undamaged locations, but the results are dissimilar between the two pairs of samples. The dissimilarity between the pairs of samples accounts for the large sample variance observed at Site 15-1.

At three other sites bulk samples were collected from both water-damaged and undamaged locations. The data points corresponding to these sites are not outliers in Figure 5. The laboratory results for these bulk samples are:

Sampling Site ID Number	Percent of Asbestos in Bulk Samples from Water-Damaged Locations	Percent of Asbestos in Bulk Samples from Undamaged Locations
16-2	0; 5	10; 10
20-3	0; 0	0; 5
24-1	60; 60	10; 20

Two of these sites have comparable levels of asbestos in samples collected from the undamaged areas and the damaged areas. The third site, like Site 15-1, has higher observed levels of asbestos in samples from the water-damaged area. The information from Sites 15-1 and 24-1 suggest that water damage might affect the determination of the asbestos content of a material. If this is the case, special consideration should be given to water-damaged areas during a site evaluation.

4.2. Components of Variance

Based on the model in Appendix E, the subset of data collected at eight sampling sites was analyzed. The number of observations made at each site, the mean percent of asbestos observed at each site and variances estimates are presented in Table 5. Note that the variability associated with the laboratory procedure ($\hat{\sigma}_{\varepsilon}^2$) is the major contributing factor to total variation.

TABLE 5. SUMMARY STATISTICS COMPUTED FOR DATA FROM EIGHT SAMPLING SITES

Sampling Site ID Number	Number of Observations, Ni	Sample Mean, $\overline{X}_{i\cdot}$	Variance Estimates[a]			
			$\hat{\sigma}_L^2$	$\hat{\sigma}_{\varepsilon}^2$	$\hat{\sigma}^2$	Percent Coefficient of Variation
15-3	16	48.1	0.00	43.75	42.92	14
16-1	16	11.6	3.91	52.60	55.73	64
18-1	16	13.1	0.00	56.25	56.25	57
19-1	16	13.4	0.00	143.23	135.73	87
21-1	16	2.8	0.26	13.02	13.23	130
23-1	16	0.4	0.15	1.48	1.60	316
24-1	16	18.4	0.00	101.56	99.06	54
25-1	16	28.9	0.00	182.29	159.58	44

(a) $\hat{\sigma}_L^2$ is an estimate of the variation attributable to sampling location within a 5000 sq ft area;

$\hat{\sigma}_{\varepsilon}^2$ is an estimate of the variation attributable to laboratory procedure;

$\hat{\sigma}^2$ is an estimate of the total variation observed in bulk samples collected from a 5000 sq ft area.

The variation observed within a room is of interest as it relates to the estimate of the amount of asbestos present in the room. The mean of the observations made in a room is used as the estimate of the percent of asbestos in the room. The variation is expressed as a percentage of the mean by the coefficient of variation statistic,

$$\text{Percent Coefficient of Variation} = (\hat{\sigma}/\overline{X}_{i\cdot}) \times 100\ \% \quad .$$

The percent coefficient of variation is presented for each of the light-sampling sites in Table 5.

4.3. Presence/Absence of Asbestos

Table 6 summarizes the bulk-sampling results expressed as asbestos present or asbestos absent. The table includes the number of bulk-sampling observations made at each site sampled during Phase II of the data collection. The table also includes the number of observations that indicate asbestos present, the number of observations that indicate asbestos absent, and the average percent of asbestos observed at each site. At eight sampling sites, Sites 16-01, 16-02, 19-01, 20-02, 20-03, 21-01, 23-01, and 23-02, analysis of multiple bulk samples produced both asbestos-positive and asbestos-negative results.

The discrepancies in the bulk-sampling results for Sites 16-01, 16-02, and 19-1 are particularly disturbing. The asbestos content present at each of these sites is estimated to be greater than 5 percent, yet analyses of some samples collected at these sites show no asbestos present. These results show that false negatives can occur even at asbestos levels as high as 13 percent. For this reason, multiple samples should be analyzed from a material suspected of containing asbestos.

The presence/absence discrepancies observed in bulk-sampling results from the five other sites are not unsettling. The amount of asbestos present at each of the sites is estimated to be less than 3 percent. At this low level of asbestos content, it is not surprising that analyses of some samples indicate no asbestos present.

TABLE 6. SUMMARY OF THE PRESENCE OR ABSENCE OF ASBESTOS IN BULK SAMPLES

Sampling Site ID Number	Number of Bulk Sampling Observations	Number of Observations Indicating Asbestos Present	Number of Observations Indicating Asbestos Absent	Average Percent of Asbestos Observed
14-01	2	2	0	60.0
14-02	2	2	0	55.0
14-03	4	4	0	45.0
15-01	4	4	0	65.0
15-03	16	16	0	48.1
16-01	16	15	1	11.6
16-02	4	3	1	6.3
16-03	2	2	0	10.0
16-04	2	2	0	5.0
17-01	2	0	2	0.0
17-02	2	0	2	0.0
17-03	4	0	4	0.0
18-01	16	16	0	13.1
19-01	16	14	2	13.4
20-01	4	0	4	0.0
20-02	2	1	1	2.5
20-03	4	1	3	1.3
20-04	2	0	2	0.0
21-01	16	7	9	2.8
21-02	2	2	0	12.5
21-03	2	2	0	5.0
21-04	2	2	0	5.0
21-05	2	2	0	12.5
22-01	2	0	2	0.0
22-02	2	0	2	0.0
22-03	2	0	2	0.0
22-04	2	0	2	0.0
22-05	2	0	2	0.0
23-01	16	3	13	0.4
23-02	2	1	1	2.5
23-03	2	2	0	7.5
24-01	16	16	0	18.4
24-02	2	2	0	30.0
24-03	2	2	0	30.0
25-01	16	16	0	28.9
25-02	2	2	0	20.0
26-01	2	2	0	40.0
27-01	2	2	0	55.0
28-02	2	2	0	17.5
29-01	2	2	0	80.0

Still, disagreements about the presence of asbestos are troublesome, and a rule for deciding an existence of asbestos is desirable. A method for combining the results from multiple samples to decide if asbestos is present or absent has been proposed (Lucas, et al., 1980). The method includes the calculation of a 90 percent confidence interval, using Student's t-distribution, for the true average percent of asbestos present at a site. If the entire confidence interval is above 1 percent, then the decision is that asbestos is present. If the entire confidence interval is below 1 percent, then the decision is that asbestos is not present. If the confidence interval includes the value 1 percent, then a decision cannot be made without additional sampling.

The method was applied to the data from the eight sites where the presence of asbestos is in question, and the resulting decisions are presented in Table 7. At every site where 16 observations were made, a decision was reached. The method is more likely to produce a decision if a large number of bulk-sampling observations are made at a site. Increasing the number of observations improves the precision of the estimate of asbestos content and shortens the length of the confidence interval. Thorough bulk sampling should be instituted if this method is to be used to decide on the presence or the absence of asbestos.

TABLE 7. PRESENCE/ABSENCE DECISIONS

Sampling Site ID Number	Average Percent of Asbestos Observed	Number of Bulk Sampling Observations	Decision
16-01	11.6	16	Asbestos present
16-02	6.3	4	No decision
19-01	13.4	16	Asbestos present
20-02	2.5	2	No decision
20-03	1.3	4	No decision
21-01	2.8	16	Asbestos present
23-01	0.4	16	Asbestos absent
23-02	2.5	2	No decision

4.4. Summary

The results of the statistical analysis indicate that the variance associated with the estimate of the asbestos content of a ceiling is related to the amount of asbestos in the ceiling. Since the amount of asbestos varies across sampling sites, the variances of the estimates of asbestos content also differ across sites. Consequently, the data from all sites cannot be pooled to estimate total variation within sites or to estimate the components of variance. Variance estimates must be calculated individually for each sampling site.

The information on variance components (Table 5) suggests some guidelines for sampling when the objective is to determine the actual level of asbestos in a ceiling. Since the variability across locations (σ_L^2) is small when compared to analytical variability, the recommendation might be to sample one location in a ceiling and make n analytical determinations in the laboratory. If the cost of sampling from different locations were high, this sampling protocol would be cost-efficient. However, since there is no cost associated with sampling from different locations, the prudent sampling procedure is to collect bulk samples from n locations and analyze each sample once in the laboratory. By following this procedure, there is no loss of precision. Furthermore, if the particular ceiling being sampled should happen to be heterogeneous with respect to asbestos content, the variation in the ceiling will not be overlooked by the sampling plan.

A summary of the presence/absence results of analysis of multiple samples collected from a site shows that false negatives can occur, even at asbestos levels greater than 10 percent. The presence/absence study indicates again the importance of collecting multiple samples to determine asbestos content.

5. FIBER-RELEASABILITY STUDY

5.1. Introduction

An accurate measure of airborne fiber levels can only be obtained by air sampling. Sebastien, et al. (Sebastien, et al. 1979 and 1980) have shown that 5-day air-monitoring sessions coupled with TEM analysis of filters produces reasonable estimates of airborne fiber levels. Such a program detects the intermittent as well as the continual release of fibers into the air. The TEM analysis includes fibers of all sizes in the estimate of airborne asbestos levels.

The benefits of an extensive sampling program, however, are not without costs. The program requires abundant manpower and sampling equipment, dependable laboratories trained in TEM analysis, and, of course, funds to cover expenses. For these reasons, it is impractical to implement a sampling program, as described by Sebastien, in schools throughout the United States.

To develop a feasible hazard-assessment program, studies have been conducted to identify factors that influence airborne fiber levels. If such factors can be identified, an assessment of these factors may serve as a surrogate for the measure of airborne fiber levels. Factors identified by Nicholson (Nicholson 1978), Sawyer (USPEA 1979b), and Sebastien, et al. (Sebastien, et al. 1979 and 1980) can be classified into two groups: (1) factors affecting the releasability of fibers from materials into the air, and (2) factors affecting the reentrainment of fibers into the air after the fibers have settled to a surface. The fiber-releasability study is concerned with factors in the first classification. Factors affecting fiber reentry have been documented by Sebastien, et al., and are not studied here.

Sawyer (USEPA 1979b) identified the asbestos content of a material and the friability of a material as determinants of fiber releasability. In the fiber-releasability study, a vibrator air-sampling technique was incorporated as a measure of releasability. The association of vibrator air sampling, asbestos content, and friability was explored with data plots.

The trends observed in these plots suggest additional relationships that might exist in the data. Several plots involving percent asbestos, percent total mineral fiber, and exposure score were also generated.

5.2. Graphical Analysis of Relationships

Plots of the data were used to explore relationships of interest. Pearson product-moment correlation coefficients were computed and are presented with each plot. The correlation coefficient assumes values between -1 and 1 and is a measure of the strength of the linear relationship between two variables being plotted. A value of zero indicates no linear relationship; values trending toward 1 indicate a direct relationship; values trending toward -1 indicate an inverse relationship. The correlation coefficients may be misleading, however, because of irregularities in some plots.

Two statistical techniques used to display the data are rescaling and averaging. When rescaling would accentuate trends in the plots, the affected variables were presented on the natural log scale. To remove a portion of the variability from the plots, the average of replicate measurements made at each site were plotted. Vibrator air-sampling results, estimates of asbestos content, and rating-form scores of Battelle and trained raters were each averaged to estimate the true values for a site. The raw data and the averages used for each plot are given in Appendix F.

5.2.1. Plots of Fiber-Releasability Factors

Figure 6 shows the plot of vibrator air-sampling results with friability scores. As indicated by Sawyer (USEPA 1979b), fiber releasability appears to increase as the friability of the material increases. In Figure 7 asbestos content is plotted against weighted friability scores. This plot shows that friability is also positively related to asbestos content. Since friability appears to be related to both measures, it may be confounding the relationship between fiber releasability and asbestos content. Figure 8 shows that vibrator air-sampling results and asbestos content are, in fact, positively related. The friability score of the Battelle rater is included in Figure 8 to show that most low friability scores are associated

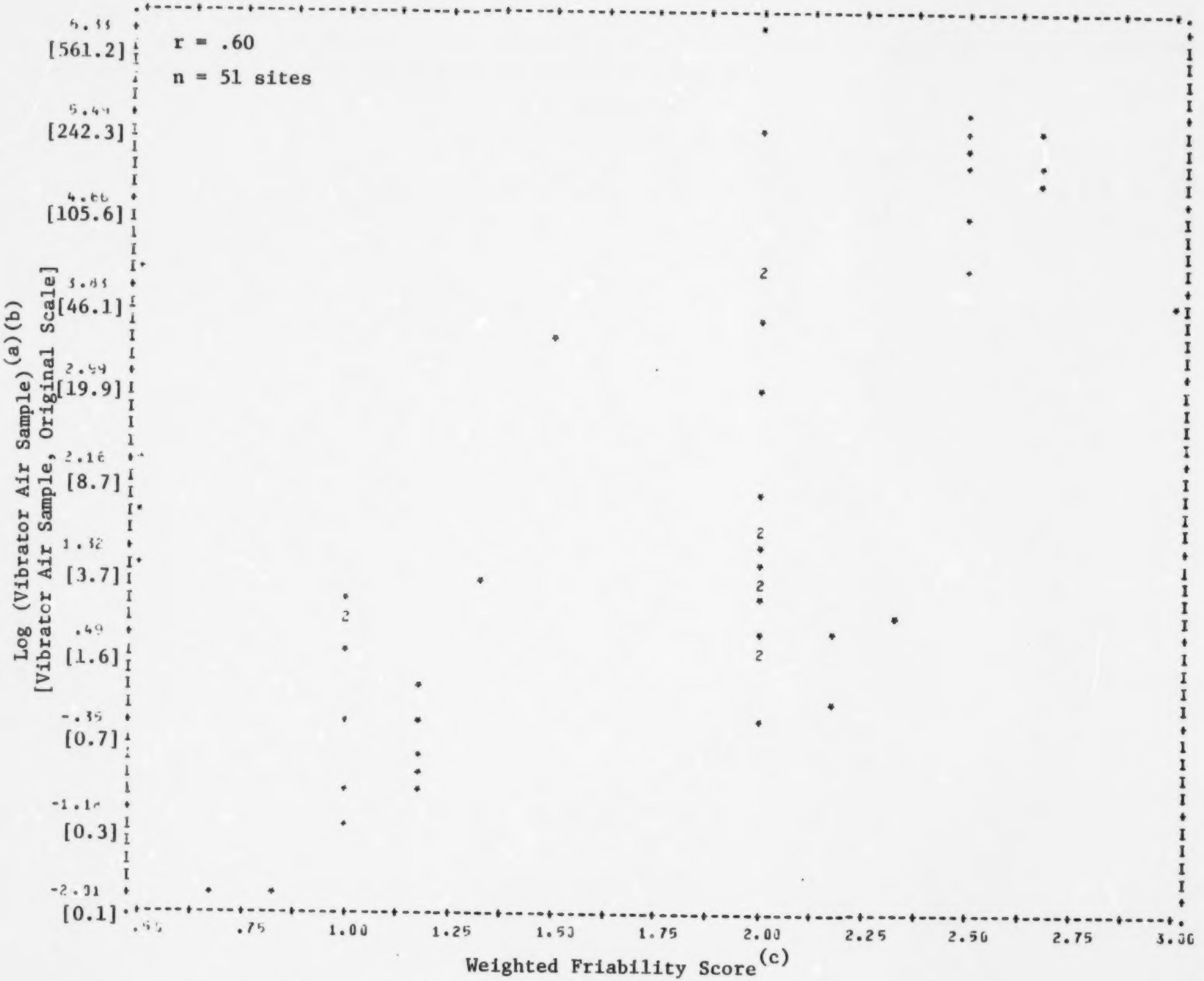


FIGURE 6

(a) for each site, log (vibrator air sample)=$\log_e$ (average vibrator air sample for the site)

(b) if average vibrator air sample for a site equals zero, the site is not included in the plot

(c) for each site, the average of the weighted friability scores of Battelle and trained raters is plotted. (See Table F-2)

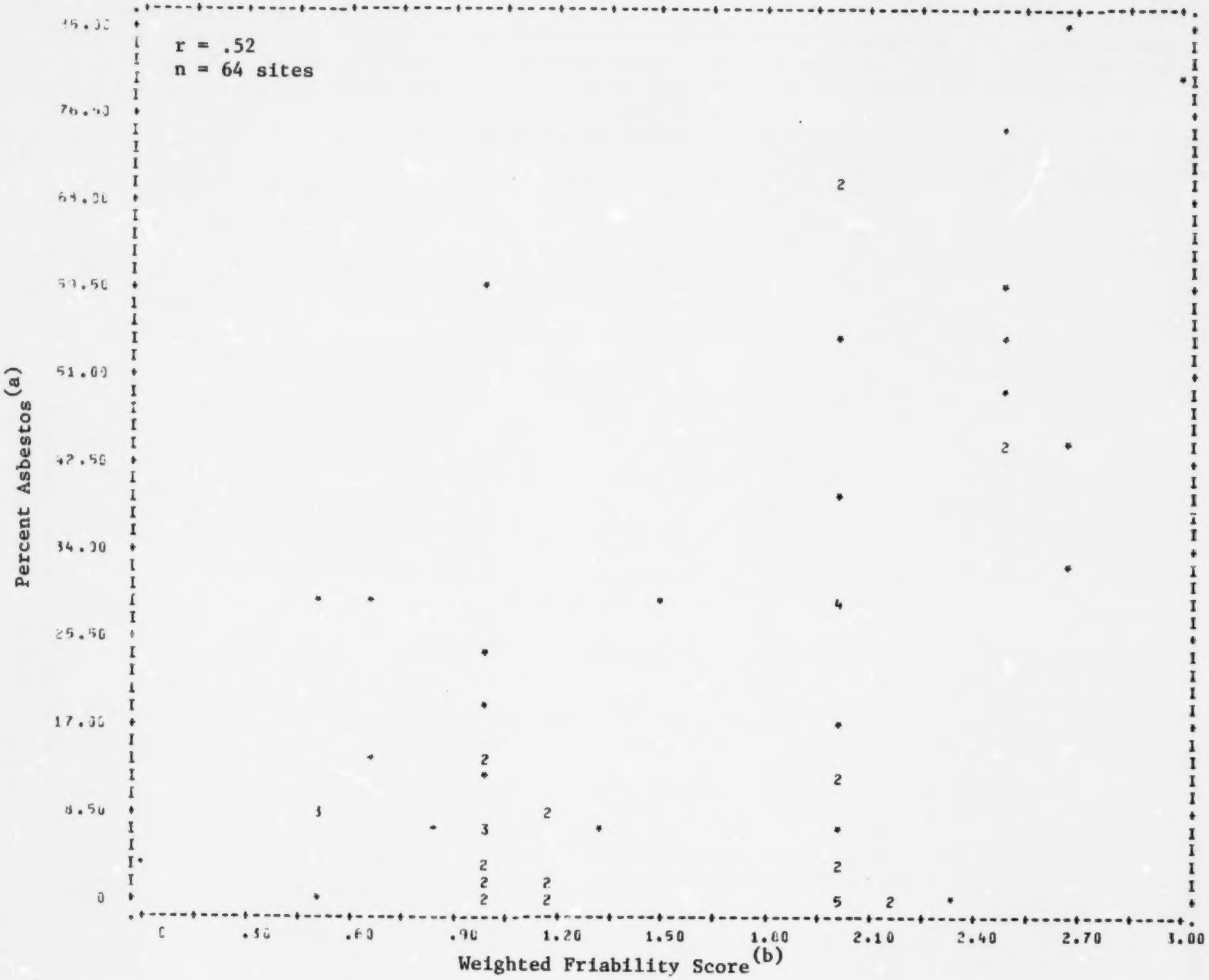


FIGURE 7

(a) for each site, the average percent of asbestos is plotted
(b) for each site, the average of the weighted friability scores of Battelle and trained raters is plotted. (See Table F-4)

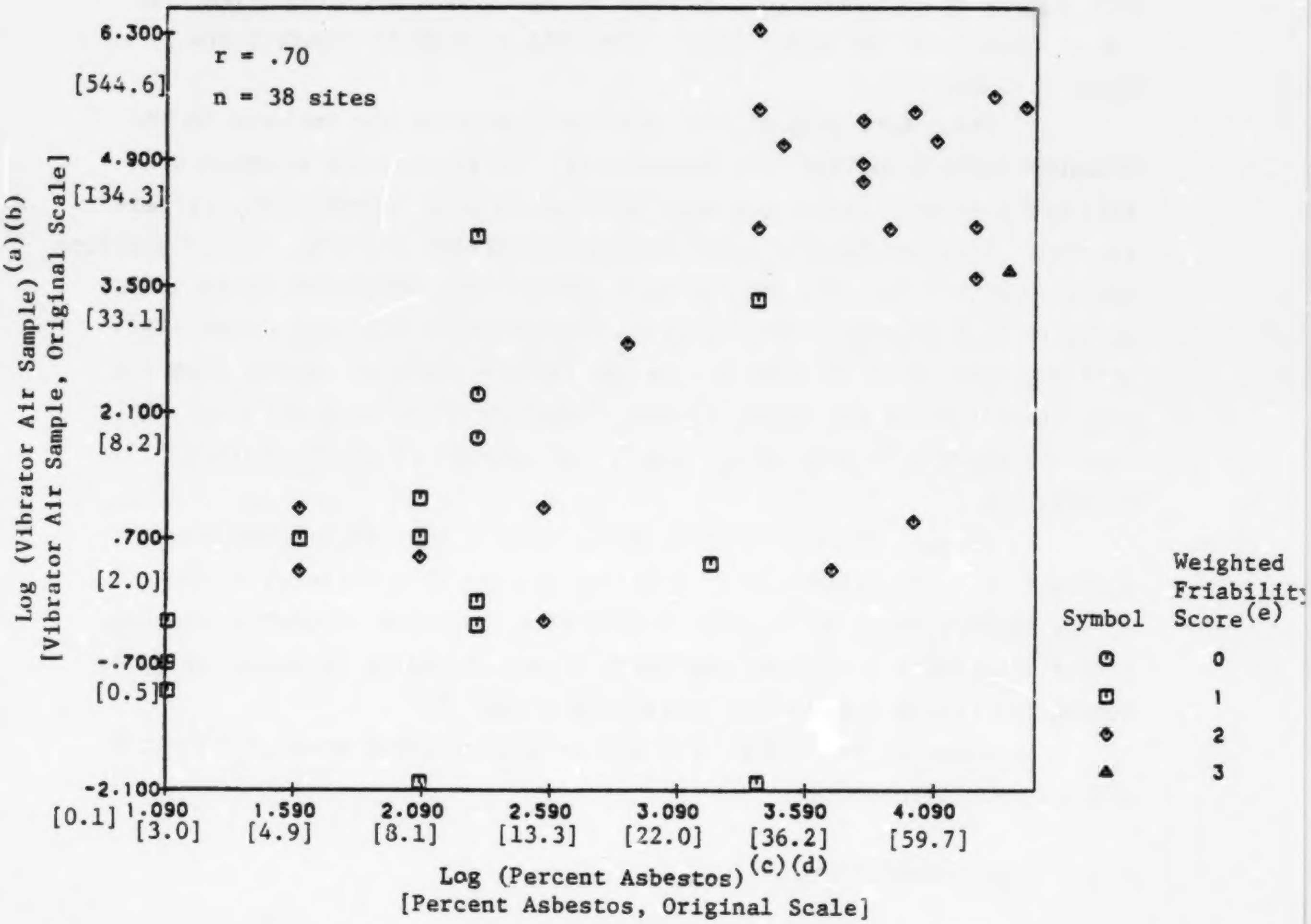


FIGURE 8

(a) for each site, log (vibrator air sample) = $\log_e$ (average vibrator air sample for the site)

(b) if average vibrator air sample for a site equals zero, the site is not included in the plot.

(c) for each site, log (percent asbestos) = $\log_e$ (average percent asbestos for the site).

(d) if average percent of asbestos for a site is less than or equal to 1%, the site is not included in the plot.

(e) the weighted friability score of one Battelle rater is indicated.

with points in the lower left quadrant of the graph, and high friability scores cluster in the upper right. The data plotted in Figure 8 are given in Table F-5.

The graphs suggest that duplicate measures are included in the exposure-score algorithm (see Appendix A). Friability and asbestos content are similar factors, and both measure, to some degree, fiber releasability. This information might be used to improve the precision of exposure scores. Both friability and asbestos content have been shown to be quite variable (see Internal Consistency Section and Bulk Sampling Variability Section, respectively). One of the two factors could be removed from the algorithm, leaving the second factor to measure fiber releasability. This revision would eliminate one of the larger sources of exposure-score variability.

Between the two factors, friability is the likely candidate for elimination. The estimation of asbestos content of a material is central to the determination of hazard. Furthermore, asbestos content is measured with a laboratory procedure, certainly a more reputable technique than the subjective rating scale used to evaluate friability.

Attempts to relate the vibrator data to other algorithm factors did not reveal anything.

5.2.2. Additional Plots

Because of the positive trend observed in Figure 7 between percent asbestos fibers and friability, the relationship between total mineral fibers and friability was explored. Figure 9 suggests that the two measures are related. The implication is that the percent of asbestos fibers in a material is not the only factor contributing to the friability of the material. Other mineral fibers also increase material friability.

An additional hypothesized relationship is that between percent of asbestos and exposure score. Figure 10 suggests that the two variables are related. This relationship exists, however, because percent of asbestos is related to the two factors included as multipliers in the exposure-score algorithm. Percent of asbestos is itself one of the multipliers. Friability

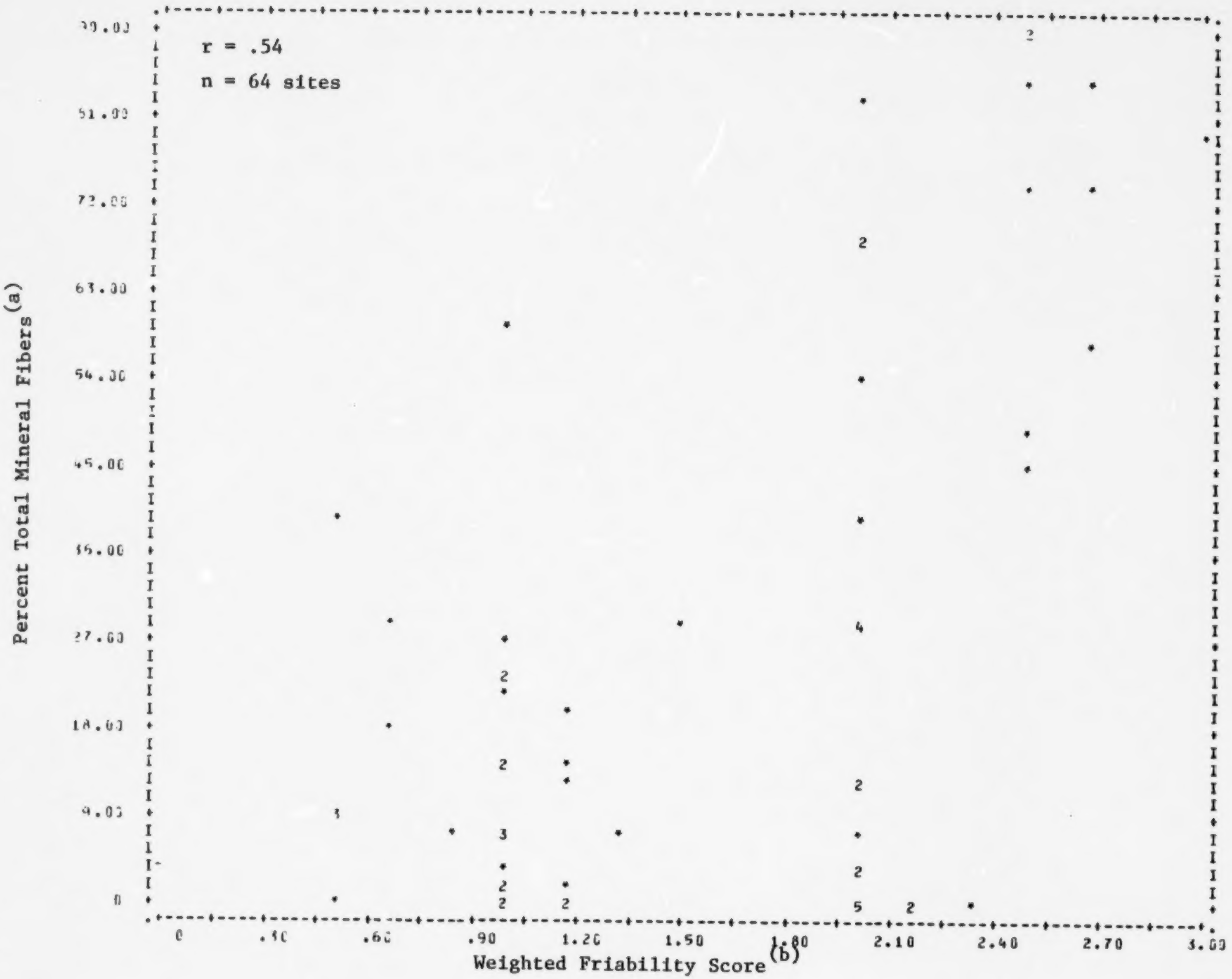


FIGURE 9

(a) for each site, the average percent of total mineral fibers is plotted.
(b) for each site, the average of the weighted friability scores of Battelle and trained raters is plotted. (See Table F-7)

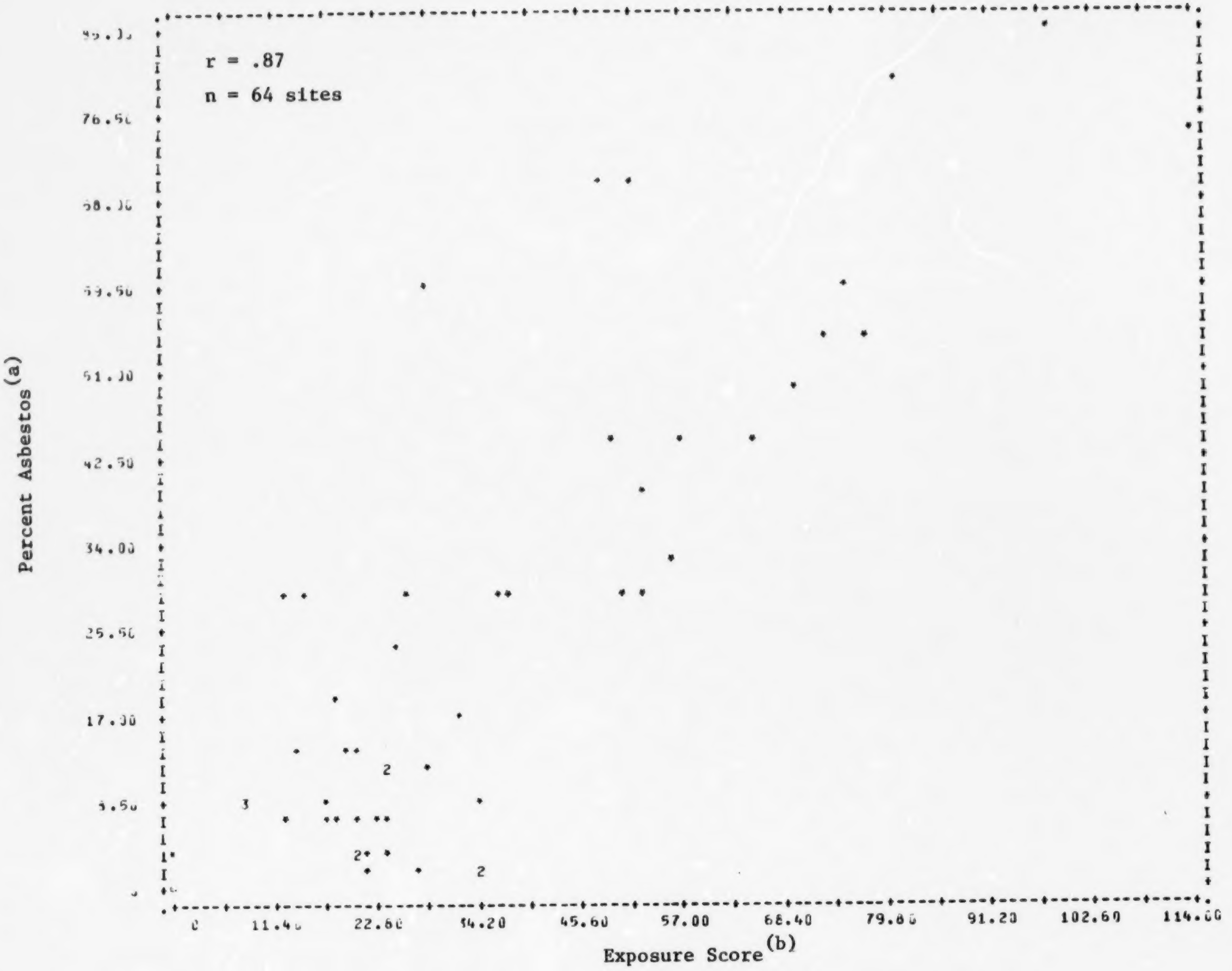


FIGURE 10

(a) for each site, the average percent of asbestos is plotted.

(b) for each site, exposure scores of Battelle and trained raters are calculated, and the average exposure score is plotted. (See Table F-9) is the second multiplier, and the relationship between percent of asbestos and friability has been demonstrated in Figure 7. Percent of asbestos was deleted from the calculation of exposure score, and the revised score is plotted with percent asbestos in Figure 11. A trend is still present, but the observed relationship is not as strong as in Figure 10. In Figure 12, percent of asbestos is plotted against exposure score calculated without either multiplier. The trend in the data is removed, indicating that the two multipliers accounted for the observed relationships.

Figure 11 (the plot of asbestos content against the partial exposure score calculated without asbestos content) suggests that the building materials fall into two clusters. One cluster is composed of points with asbestos content ≥30 percent and partial scores ≥20 and the other, of points with asbestos content ≤30 percent and partial scores ≤20. The first group is composed of the typically more friable materials. This is apparent in Figure 8 where the friability scores are indicated.

The condition of the materials was not found to be related to either asbestos content or friability.

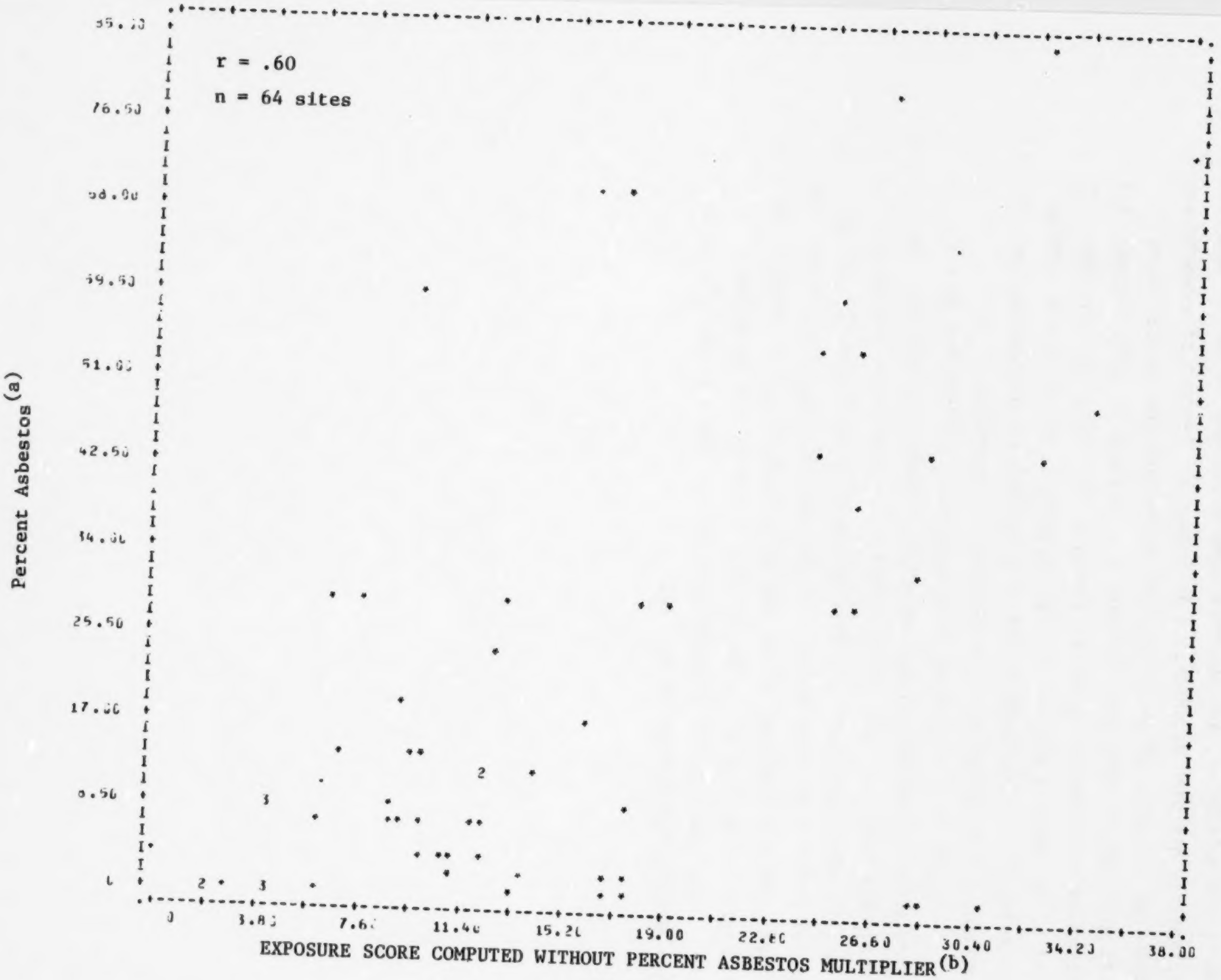


FIGURE 11

(a) for each site, the average percent of asbestos is plotted.

(b) for each site, partial exposure scores of Battelle and trained raters are calculated, and the average partial exposure score is plotted. (See Table F-10)

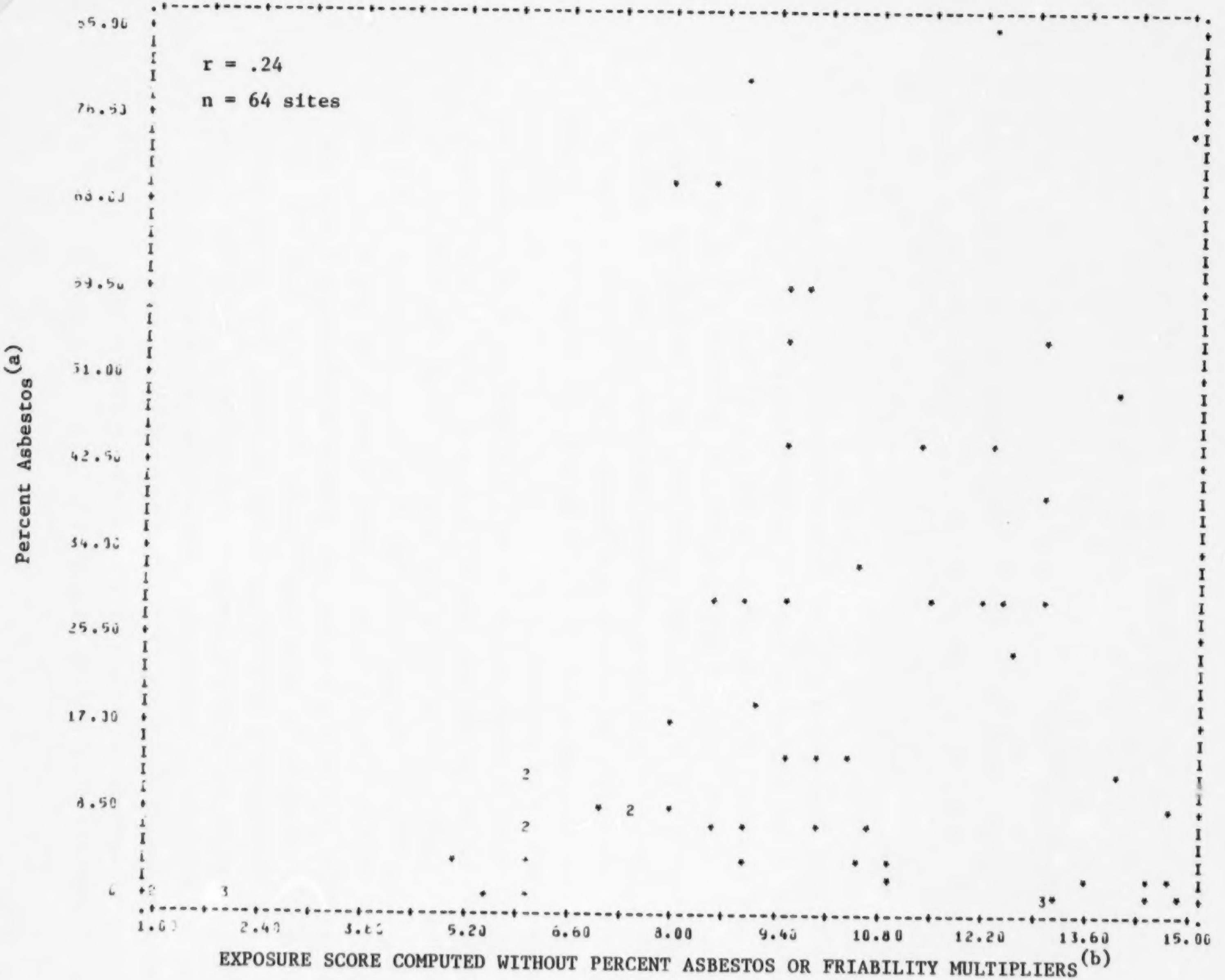


FIGURE 12

(a) for each site, the average percent of asbestos is plotted.

(b) for each site, partial exposure scores of Battelle and trained raters are calculated, and the average partial exposure score is plotted. (See Table F-11)

6. AIR SAMPLING

A discussion follows of the results of air sampling under normal-activity conditions and while floors were being swept.

6.1. Normal Air Sampling

Airborne fiber levels during normal-activity periods were measured with collection filters analyzed by PM and also with the FAM.

6.1.1. Collection Filters

The relationship between airborne fiber levels, as measured by the collection filter method, and exposure scores calculated from rating-form data were examined. Using the data collected during Phase I of sampling, PM counts were plotted against exposure scores. To eliminate a portion of the variability that exists in the rating-form data, only the exposure scores computed from the scores of the Battelle raters were included. If the two measures are related, there would be a pattern in the plot of the data. If no relationship exists between PM counts and exposure scores, the plot would show a random scatter of points.

Figure 13 shows the plot of PM counts against exposure scores. No pattern is evident in the data, and the plot shows random scatter for the majority of points. There is one site with a PM value of 0.17 fibers/cc that is removed from the general scatter of points. The exposure scores for this site are also somewhat larger than the scores in the cluster of points. For this site, the rating form may have detected the increased hazard associated with the higher airborne fiber level.

The lack of a relationship between PM counts taken during normal activity periods and exposure scores is not surprising. While the PM counts indicate the current exposure level in a room, the exposure scores are intended to measure the potential hazard associated with asbestos exposure. The two measurement techniques do not measure the same quantity and should not be expected to be strongly related.

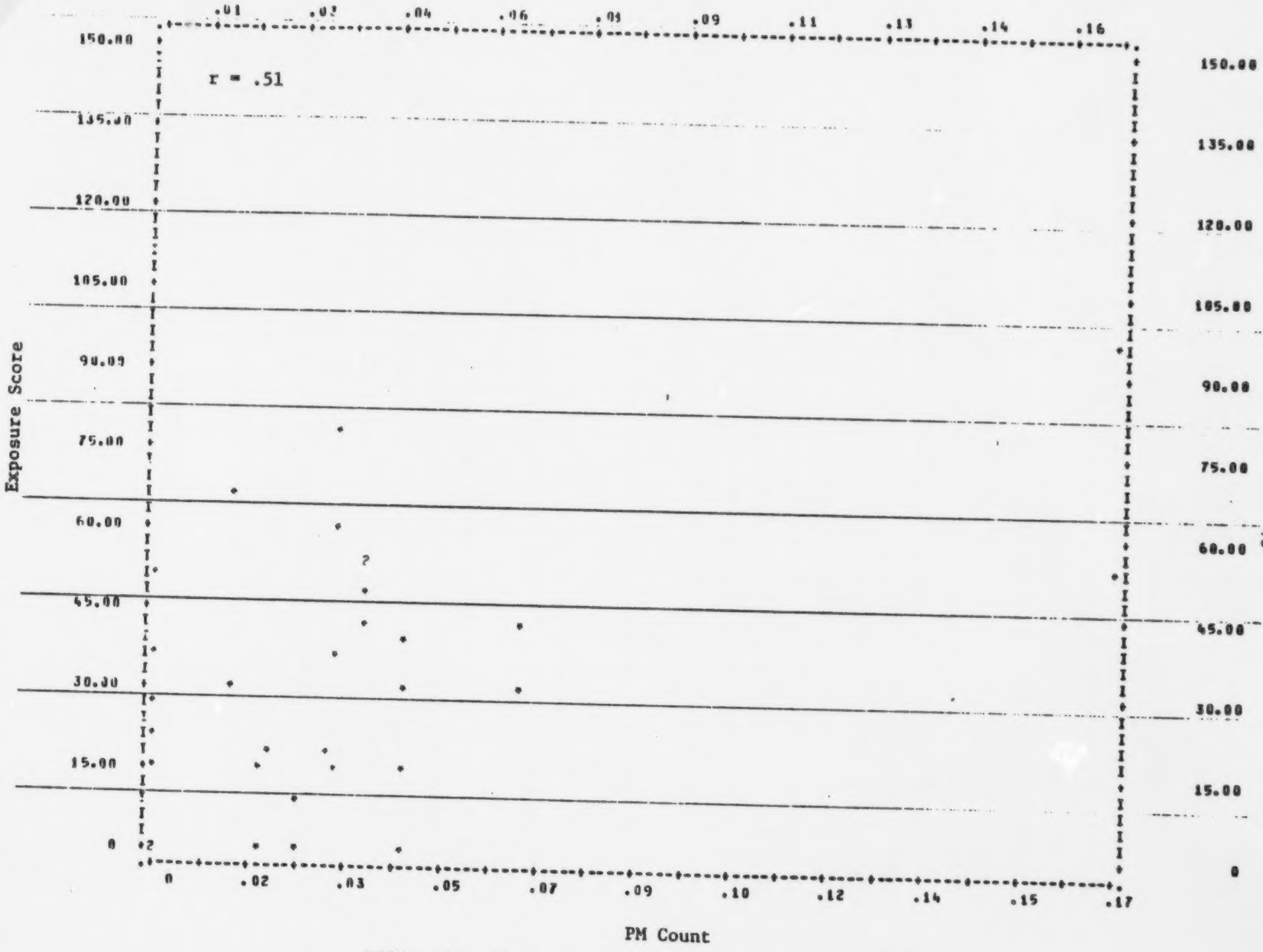
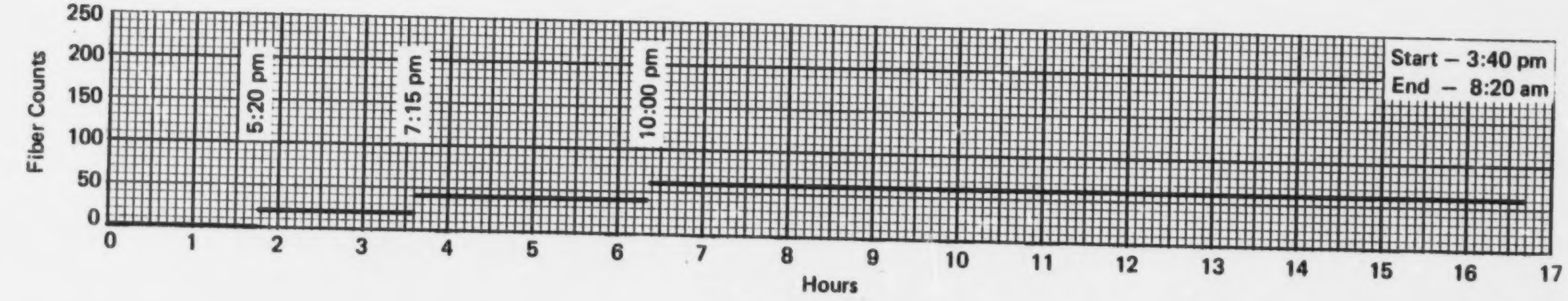


FIGURE 13. PLOT OF EXPOSURE SCORES AGAINST PM COUNTS

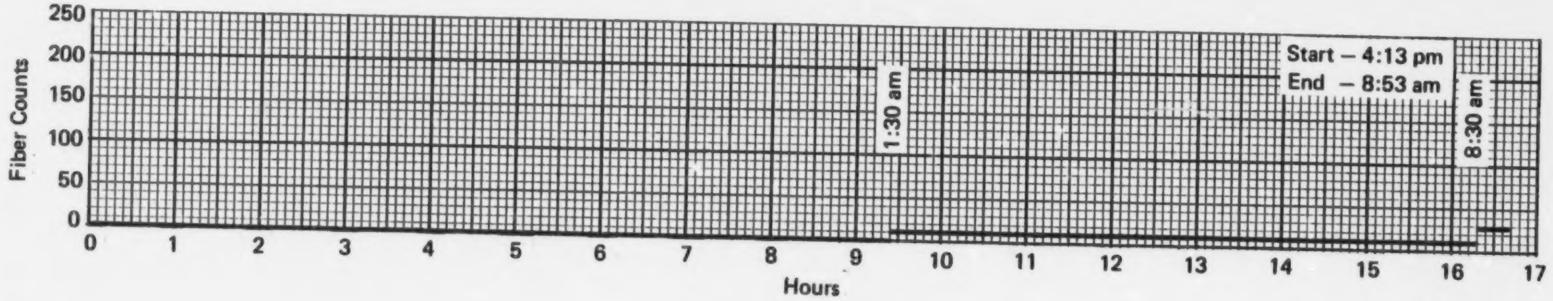
The collection filters from five sites (8-1, 8-2, 8-5, 9-3, and 11-2) and an ambient sample were also analyzed by TEM. The results are in Table B-2. The relatively high value of 0.17 fibers/cc obtained by PM for Site 8-1 (page B-7) was confirmed by TEM, which yielded 0.20 fibers/cc for fibers longer than 5 microns. At the other sites the PM values (Table B-1) were 0.06 fibers/cc or less, and TEM yielded values of 0.03 fibers/cc or less for fibers longer than 5 microns. The TEM results indicate that the major fraction of the fibers measured are small fibers, less than 5 microns. The sample-preparation procedure for TEM analysis is not believed to result in breakup of fibers; so this result should reflect the actual fiber distribution in the air. The TEM results also suggest that the asbestos in the air came from the ceiling material in the rooms, for the air samples from the rooms were found to contain asbestos amphiboles as did the bulk samples of the ceiling materials, whereas the ambient sample contained only chrysotile fibers.

6.1.2. Continuous Monitoring with the FAM

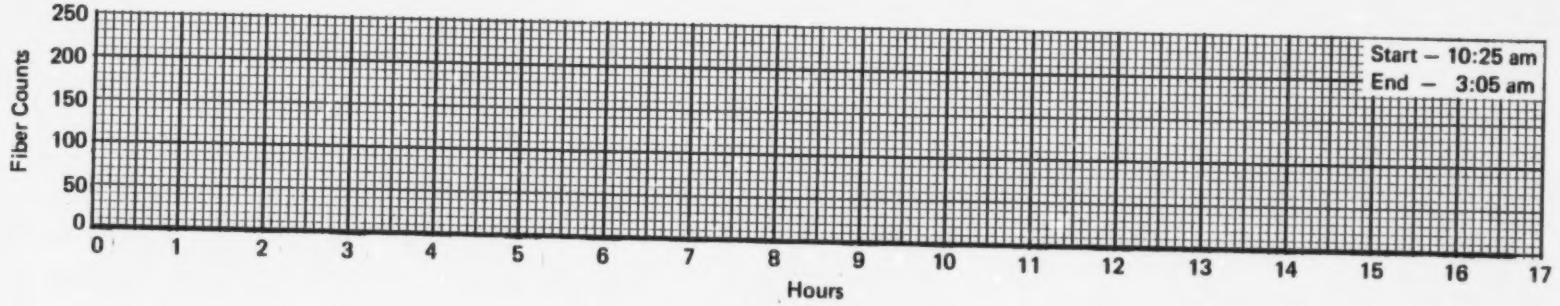
The results of continuous monitoring of airborne fiber levels with the FAM are given in Figure 14. The figure shows reproductions of the strip-chart recorder traces obtained at five sites in schools and at an outdoor ambient site on the Battelle grounds in Columbus, Ohio. The traces show the accumulated fiber counts detected by the FAM as a function of time. Airborne fibers were detected at only two of the six sites, Site 16-5 which is a school library and Site 18-3 which is a school office. Neither one was a sampling site used in the other portions of this study, so no bulk sampling or rating of paradigm factors were done for them. The asbestos content of the other ceilings in Building 16 was 5-10 percent chrysotile, and the ceiling of Site 16-5 had a comparable appearance; so Site 16-5 probably was the same in asbestos content. Site 18-3 was adjacent to Site 18-2 which had an asbestos content of 10-20 percent chrysotile; so Site 18-3 was probably comparable.



a. Site 16-5, Library

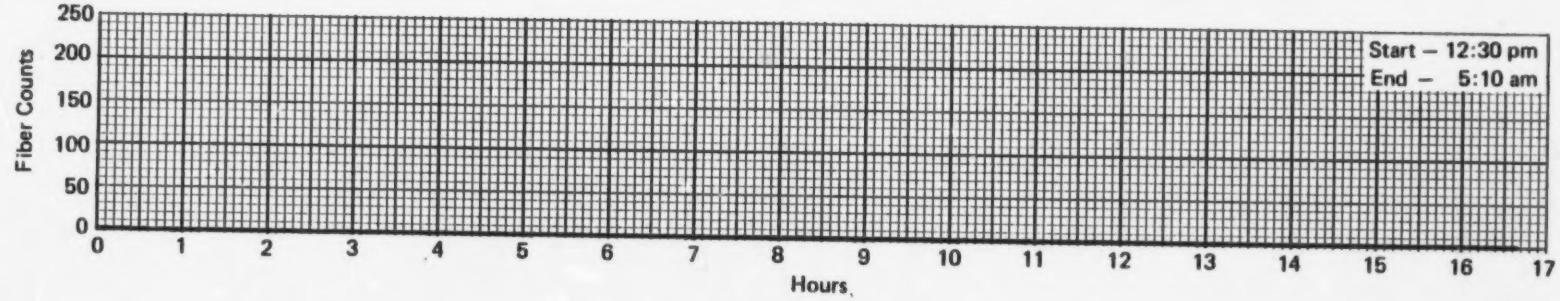


b. Site 18-3, Administrative Office

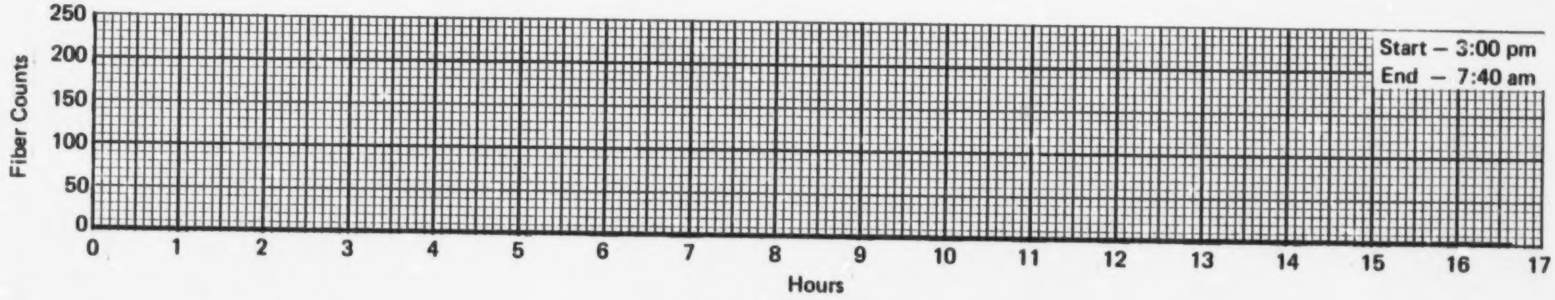


c. Site 21-5, Classroom

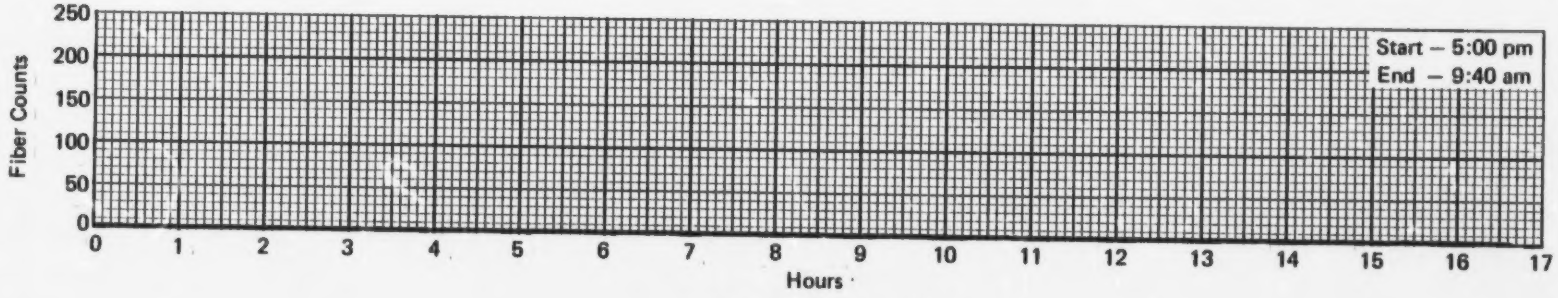
FIGURE 14. CONTINUOUS MONITORING WITH THE FIBROUS AEROSOL MONITOR (FAM)



d. Site 23-1, Library



e. Site 26-1, Air Plenum



f. Outdoors, Columbus, Ohio

FIGURE 14. (Continued)

At both sites where fiber counts showed in the traces (Figures 14a and 14b), the fibers were detected intermittently. At Site 16-5 three distinct increases in the fiber count were observed, and at Site 18-3 two increases were detected. No particular activity going on within these sites can be correlated with the intermittent increases in fiber levels, with the possible exception of the increase at the beginning of the day (at 8:30 a.m.) at Site 18-3. The other increases all occurred when the schools were closed. Averaging the fiber counts over the 1000-minute sampling periods at these two sites yields average airborne fiber concentrations of 0.0061 fibers per cm^3 for Site 16-5 and 0.0027 fibers per cm^3 for Site 18-3. A 1-hour collection filter sample was taken at Site 16-5, and the PM analysis of it yielded an airborne fiber level of 0.8 fibers per cc; however, the fibers may not have been asbestos. The room was carpeted and the fibers detected by PM (and possibly by the FAM) may have been carpet fibers.

Site 21-5 contained 5-20 percent chrysotile, but no counts were recorded by the FAM with the strip-chart recorder. Site 26-1 contained 40 percent chrysotile, but it also yielded no counts with the FAM even though the ceiling was in poor condition. A 1-hour collection filter sample obtained at Site 26-1 yielded a fiber level of 0.01 fibers/cc. No counts were recorded at Site 23-1 either, but the bulk sample from this site showed the material to contain no more than a trace of asbestos.

6.2. Air Sampling During Sweeping

A sweeping experiment was conducted at three sampling sites to determine if the process of sweeping floors increases airborne fiber levels. The evaluation of the three sites by a Battelle rater using the original rating form is presented in Table 8. No asbestos was present in the ceiling at Site 12-1,but asbestos was present in the ceilings at Sites 13-1 and 13-2.

Wipe samples were taken from surfaces in the schools to determine if fibers were present on these surfaces. The samples were obtained by wiping areas of approximately 100 cm^2 with 47 mm Millipore filters. The wipe samples were analyzed by PM, and the number of fibers counted on each filter is reported in Table 9. These numbers merely indicate the presence or absence of fibers on floors and other surfaces. The numbers are not quantitative measures, and the numbers for different filters are not comparable.

TABLE 8. FACTOR SCORES -- SWEEPING EXPERIMENT

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES								
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score
12	01	1	5	1	1	1	2	3	1	1	0	0
13	01	1	5	4	3	4	2	3	1	3	47	84
13	02	1	5	2	2	4	2	3	1	1	28	42

TABLE 9. WIPE SAMPLES FOR SWEEPING EXPERIMENT

Sampling Site Identification					
Bldg	Site	Location Sampling	Surface	Before or After Sweeping	Number of Fibers Counted
12	01	1	Hanging light	Before	300,000
12	01	1	Floor	Before	200,000
12	01	1	Floor	After	0
13	01	1	Floor, near wall	Before	70,000
13	01	1	Floor, middle of room	Before	300,000
13	01	1	Bulletin board, top ledge	Before	30,000
13	02	1	Floor	Before	300,000
13	02	1	Blackboard, top ledge	Before	50,000
13	02	1	Floor	After	100,000

Ambient air samples were taken outside the main entrance of Building 12 and in the parking lot of Building 13. The samples were taken with collection filters mounted 5 feet from the ground and with 10-minute FAM runs. The results are given in Table 10. Also in Table 10 are the results of air sampling done prior to sweeping and during sweeping, and air sampling done with a personnel monitor. Selected filters were analyzed by TEM, and the results presented in Table 11.

The PM results of filters collected during sweeping are similar to the PM results of filters collected before sweeping and of ambient filters. The FAM results indicate somewhat higher airborne fiber levels during sweeping than before sweeping. The analysis of filters housed in the personnel monitor produced the highest fiber counts observed at the sites.

TABLE 10. AIR SAMPLES FOR SWEEPING EXPERIMENT

Sampling Site Identification			Ambient Air Sample (Fibers/cc)		Air Samples Prior to Sweeping (Fibers/cc)		Air Samples During Sweeping (Fibers/cc)		Personnel Monitor
Bldg	Site	Sampling Location	PM	FAM	PM	FAM	PM	FAM 10-Min Run[(a)]	
12	01	1	0.03	0.01	--	--	0.03	0.09	0.44
				0.00				0.21	
				0.01				0.08	
				0.04				0.17	
				0.03				0.31	
				0.03				0.20	
13	01	1	0.01	--	0.18	0.03	0.03	0.05	3.03
						0.00		0.10	
						0.00		0.05	
						0.00		0.03	
						0.01		0.02	
						0.00		0.15	
13	02	1	0.01	--	0.03	0.02	0.02	0.04	0.80
						0.01		0.05	
						0.00		0.08	
						0.03		0.05	
						0.01		0.04	
						0.01		0.17	

(a) 10-minute FAM runs are described in the data collection section of this report.

TABLE 11. RESULTS OF TEM ANALYSES FOR SWEEPING EXPERIMENT

	Sample	Number of Grid Openings Analyzed	Type of Asbestos	Fibers < 5μ		Fibers > 5μ		Total Asbestos Fibers, ng/m^3
				Fibers Counted	Fibers per cc	Fibers Counted	Fibers per cc	
12-1	Personnel Monitor	10	Chrysotile	52	6.1	0	<0.12	62
13-1	Personnel Monitor	8	Chrysotile	101	14.9	0	<0.15	150
13-2	Personnel Monitor	10	Chrysotile	28	3.3	0	<0.12	180
13-1	Filter Sample Before Sweeping	4	Chrysotile	129	2.7	3	0.06	41
--	Blank	10	Chrysotile	6	--(a)	0	--(a)	--(a)

(a) No air was filtered through the blank; so fibers per cc and ng/m^3 cannot be calculated.

7. CONCLUSIONS

Four approaches to assessing the potential for asbestos exposure in schools were evaluated in this study: (1) a proposed exposure-ranking system or algorithm, (2) bulk sampling and analysis of the asbestos-containing materials, (3) measurement of stimulated fiber release, and (4) air sampling.

If the rating form used in scoring the various factors in the algorithm is to be useful as a measurement tool, the precision of the form must be improved as much as possible. The data from the study suggest that training of the raters in the use of the form improved the scoring consistency. With more intensive training than the 4-hour session used in this study, additional improvement might result. The factors which were scored with the least consistency, even with training, were friability and activity. Exposure and the presence of an air-moving system were scored with the most consistency. With untrained raters, an expansion and improvement of the rating form did not result in improved scoring consistency. Neither form may be meaningful to untrained raters.

One of the factors in the algorithm, percentage of asbestos present, is scored by obtaining bulk samples of the material and analyzing them in the laboratory. The variability associated with the laboratory analysis was found to be the major contributing factor to the total variation, and the variance was found to be related to the asbestos content. The variability associated with sampling at different locations in a 5000-sq ft area was small in comparison. This suggests that it might be sufficient to obtain one sample of each ceiling of interest and perform replicate analyses on that sample; however, the problem of false negatives makes that procedure questionable. False negatives were found to occur, even at asbestos levels greater than 10 percent. Procurement of multiple samples of each ceiling is thus the recommended procedure.

The measurements of stimulated fiber release conducted with the vibrator demonstrated that the asbestos content and friability were the primary factors influencing fiber releasability. The releasability, as determined by the vibrator technique, was found to increase with the asbestos content and with friability. Attempts to relate the releasability to other algorithm factors and multiples of factors did not reveal anything.

Since the population of materials which have the greatest potential for fiber release are those which have a high asbestos content and high friability, they should be the ones to receive the most attention in an asbestos control program. The friability scores, in general, were found to increase with the asbestos content, at least for the materials examined in this study. Thus any low friability score assigned to a material with a high asbestos content should be viewed with suspicion though there can be exceptions (such as cementitious materials). The scores for condition of materials were not found to be related to either asbestos content or friability, but any asbestos-containing material which is badly damaged should probably be dealt with.

No relationship was found between the airborne fiber levels measured in schools for fibers greater than 5 microns (OSHA fibers) and the exposure scores computed from the algorithm. This is not surprising since the algorithm is intended to be a measure of potential exposures and not current exposures, and since the airborne fiber levels were found to be low (less than 0.07 fibers/cc in all cases but one). Continuous monitoring of airborne fiber levels at a few sites yielded a limited amount of evidence that release of fibers into the air, either by reentrainment or by fiber release from asbestos-containing materials, is an intermittent process. An experiment to determine if sweeping floors increases airborne fiber levels was not conclusive.

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APPENDIX A

RATING FORM AND COMPUTATION OF EXPOSURE SCORES

The Original Rating Form

Background

Epidemiological studies have shown that exposure to asbestos fibers constitutes a potential health hazard. Unfortunately, for several decades asbestos has been included in many construction products, including fireproofing, insulation, and decorative materials. Battelle's Columbus Laboratories is conducting this study for the U.S. Environmental Protection Agency to investigate one aspect of the asbestos issue. Your assistance is sincerely appreciated. Please read the following explanation and complete the rating form.

Instructions

The rating form consists of seven factors that should be considered when determining whether a hazardous condition exists due to the presence of asbestos. The purpose of this study is to test the usefulness of each factor for predicting the corrective action to be taken. This is accomplished by comparing the results from the rating form to quantitative methods of asbestos analysis. Hopefully, this study will produce a rating form that can be used to visually assess the potential for asbestos exposure in a room.

Below are criteria to consider in rating each factor:

CONDITION: Is the material cohesive, and does the material adhere to the underlying surface? Is the material deteriorating or damaged?

ACCESSIBILITY: Can the material be reached? Is it accessible and subject to accidental or intentional contact and damage?

INTEGRITY: To what extent can the material be broken apart when a person makes contact with it?

PART OF AIR MOVING SYSTEM: Is the material present in a direct air stream of a ventilation or heating system?

EXPOSURE: Is the material exposed? Is it visible?

WATER DAMAGE: Has water dislodged, delaminated or disturbed the material? Has water transported the material?

ACTIVITY OR MOVEMENT: Is there general air movement, building vibration or any other source of movement in the area? Are building occupants or maintenance workers active in the area of the material?

One rating form should be completed for each area that is being inspected. The numbers beside each box are specifications for keypunchers and can be ignored.

The Original Rating Form (Contd)

Bldg No. ______ 1-5
Site No. ______ 6-10
Date ___/___/___ 11-20

CONDITION ☐ 22

1. No damage
2. Mild damage
3. Moderate damage
4. Severe damage

ACCESSIBILITY ☐ 24

1. Enclosed
2. Inaccessible -- beyond reach during normal activity
3. Accessible

INTEGRITY ☐ 26

1. Firmly bound
2. Difficult but possible to damage by hand
3. Fairly easy to dislodge and crush
4. Fluffy, spongy, flaking &/or pieces hanging

PART OF AIR MOVING SYSTEM ☐ 28

1. Yes
2. No

EXPOSURE ☐ 30

1. Enclosed
2. 10% exposed
3. Greater than 10% exposed

WATER DAMAGE ☐ 32

1. None
2. Minor
3. Severe

ACTIVITY OR MOVEMENT ☐ 34

1. None or low (libraries & some classroom)
2. Moderate (some classrooms & corridors)
3. High (some corridors)

COMMENTS: ______________________________

Computation of Exposure Score

(1) Determine the weights for each of the seven factors.

(2) Using the weighted factor scores, compute

SUM = CONDITION + ACCESSIBLITY + AIR MOVING
SYSTEM + EXPOSURE + WATER DAMAGE
+ ACTIVITY.

(3) Multiply SUM by the weighted factor score for INTEGRITY and the weighted factor score for percent of asbestos.

EXPOSURE SCORE = SUM x INTEGRITY x PERCENT ASBESTOS.

TABLE A-1. FACTOR WEIGHTS FOR ORIGINAL RATING FORM

Factor	Unweighted Scores	Weighted Scores
Condition		
No Damage	1	0
Mild Damage	2	2*
Moderate Damage	3	2*
Severe Damage	4	5
Accessibility		
Enclosed	1	0
Inaccessible - beyond reach during normal activity	2	1
Accessible	3	3
Part of Air Moving System		
No	2	0
Yes	1	1
Exposure		
Enclosed	1	0
10 percent exposed	2	1
Greater than 10 percent exposed	3	4
Water Damage		
None	1	0
Minor	2	1
Severe	3	2
Activity or Movement		
None or low	1	0
Moderate	2	1
High	3	2
Integrity		
Firmly bound	1	0
Difficult but possible to damage by hand	2	1
Fairly easy to dislodge and crush	3	2
Fluffy, spongy, flaking, pieces hanging	4	3
Percentage Asbestos		
Less than or equal to 1 percent	-	0
Greater than 1 percent and less than or equal to 50 percent	-	2
Greater than 50 percent	-	3

*A weighted score of 2 was used for both mild and moderate damage.

The Revised Rating Form

INSTRUCTIONS

This booklet can be used to evaluate the health hazard associated with a material that contains asbestos. The hazard associated with an asbestos-containing material depends on seven factors:

- the condition of the material
- the accessibility of the material
- the friability of the material
- the proximity of the material to air moving systems
- the amount of the material that is exposed
- the amount of the material that is water damaged
- the activity level near the material.

The seven factors are described in this booklet. Scores for each factor follow the factor description.

Please read the description of each factor. Select the factor score that is most appropriate for the material that you are evaluating. Write the number of that score in the space provided for the factor on the scoring sheet.

CONDITION

To evaluate the condition of the material, consider two questions:

- What percentage of the material is damaged or deteriorating?
- Have only small pieces of the material (no bigger than a half-dollar) been dislodged from the underlying surface, or is the material noncohesive with large pieces dislodged from the surface?

Based on these two questions, score the condition of the material as follows:

(1) No Damage--The material is intact.

(2) Moderate Damage--10% or less of the material is damaged,

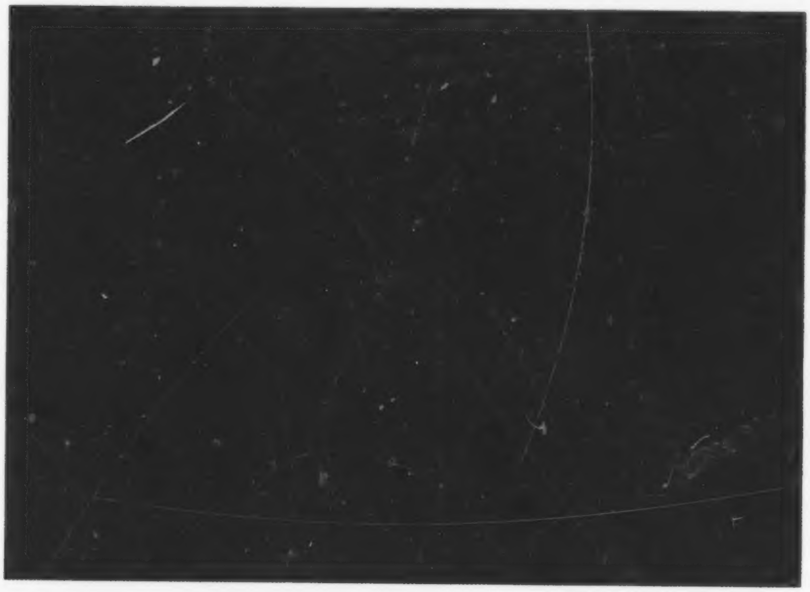
and

only small pieces of the material have been dislodged.

(3) Severe Damage--Greater than 10% of the material is damaged,

and/or

large pieces of the material have been dislodged.



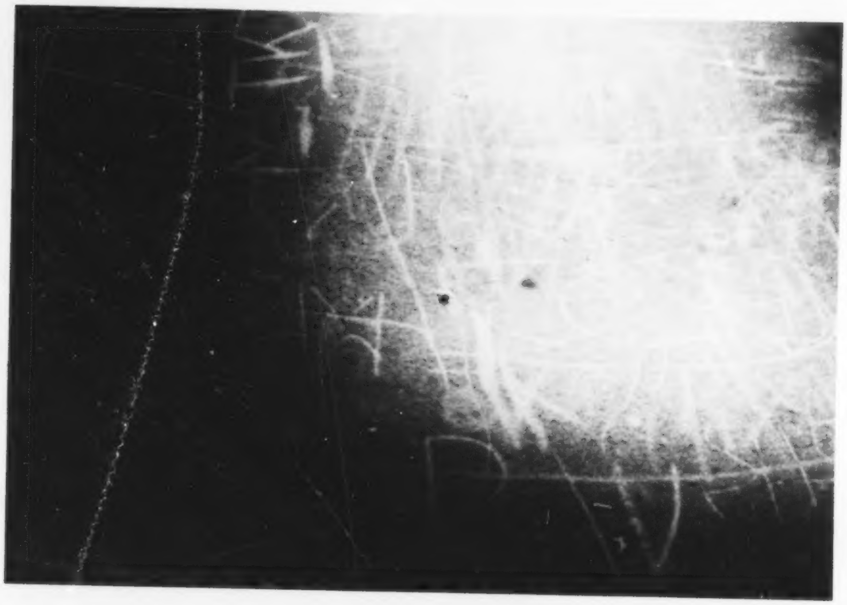
ACCESSIBILITY

If the material can be reached, it is accessible. Consider the behavior of the people who frequent the area of the material, and score the accessibility of the material as follows:

(1) Not Accessible--The material is located above a suspended ceiling, and building occupants cannot contact the material.

(2) Rarely Accessible--The material is contacted only during abnormal activity such as infrequent maintenance or repair of nearby heating, ventilation, lighting or plumbing systems. Building occupants infrequently jump and touch the material or throw objects against it.

(3) Accessible--Building occupants contact the material during normal building activity. Occupants frequently contact the material, jump and touch the material or throw objects against it.

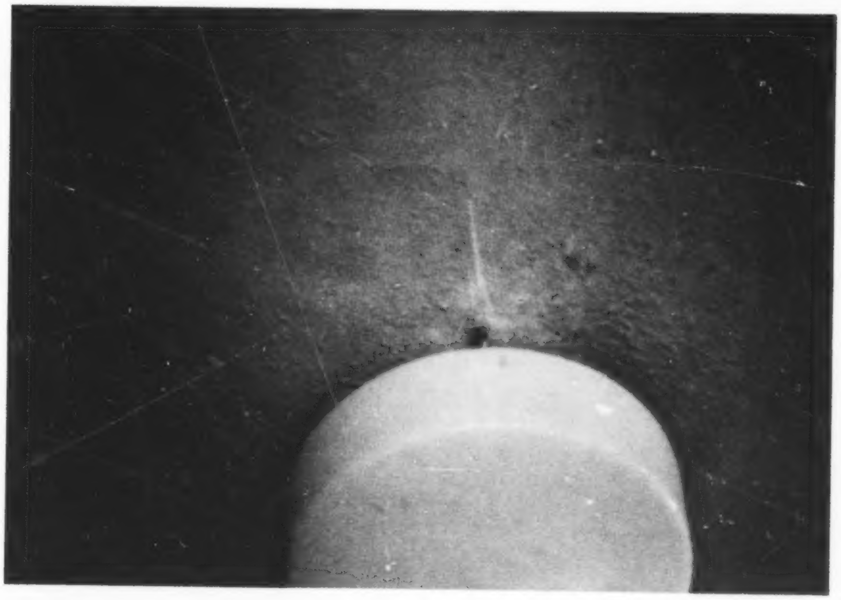


FRIABILITY

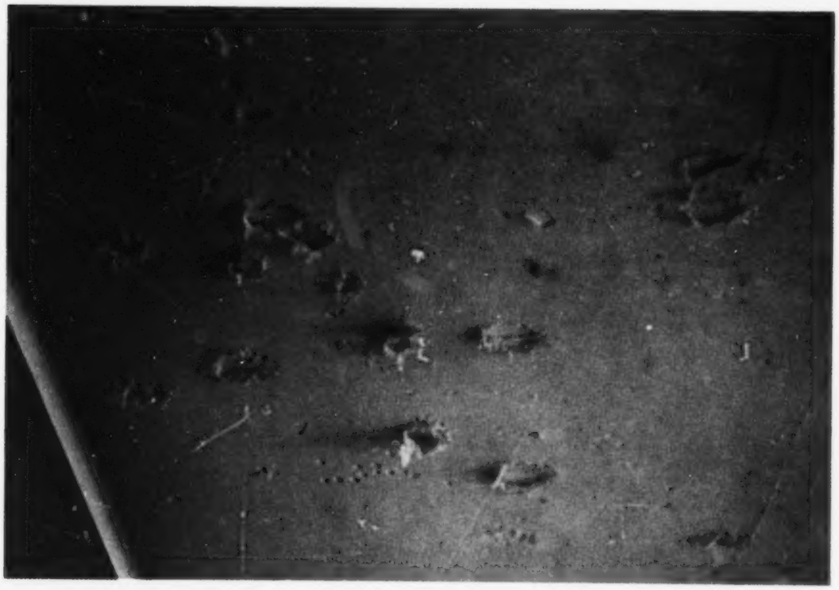
The material being rated MUST BE TOUCHED to determine how friable it is. The term "FRIABLE" is defined as "easily crumbled or crushed into powder". To what extent can the material be broken apart when a person makes contact with it? Using the canister supplied by Battelle for testing, score the friability of the material as follows:

(1) Not Friable--Cannot penetrate the surface with pressure and twisting of canister.

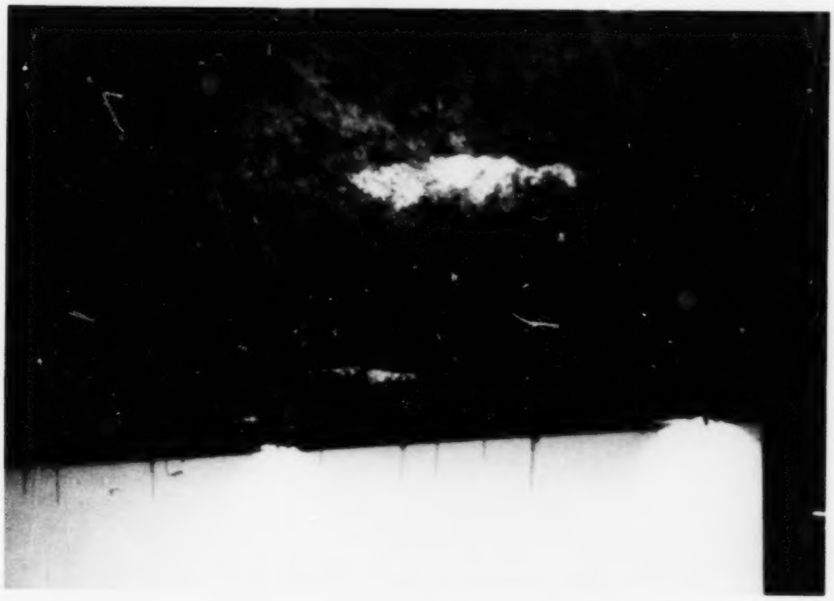
(2) Low Friability--Difficult to penetrate surface with pressure and twisting of canister. Material may be removed in large chunks.



(3) Moderate Friability--Can penetrate surface easily with slight pressure and twising of canister. Material may be removed in small or large pieces.



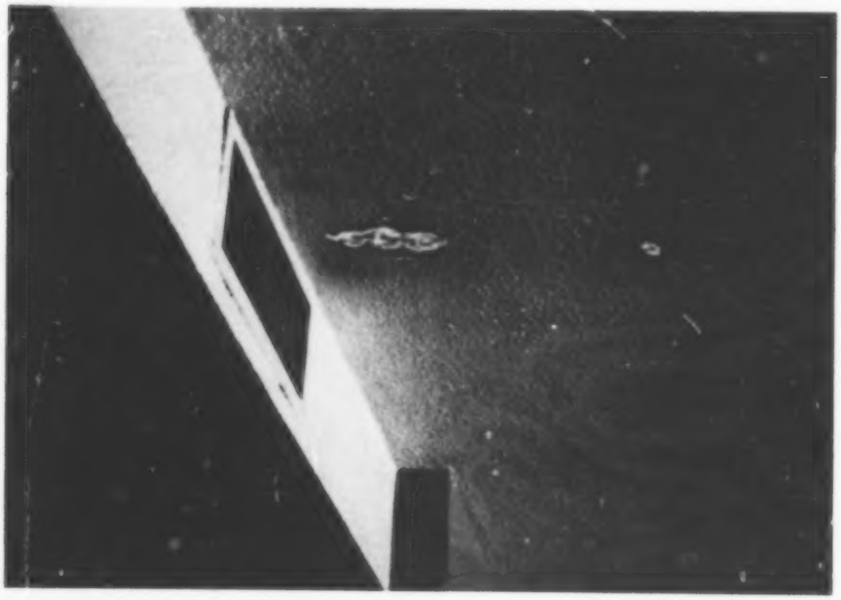
(4) High Friability--Can penetrate surface easily with very slight pressure and twisting of canister. Material removed is flaky and powdery.



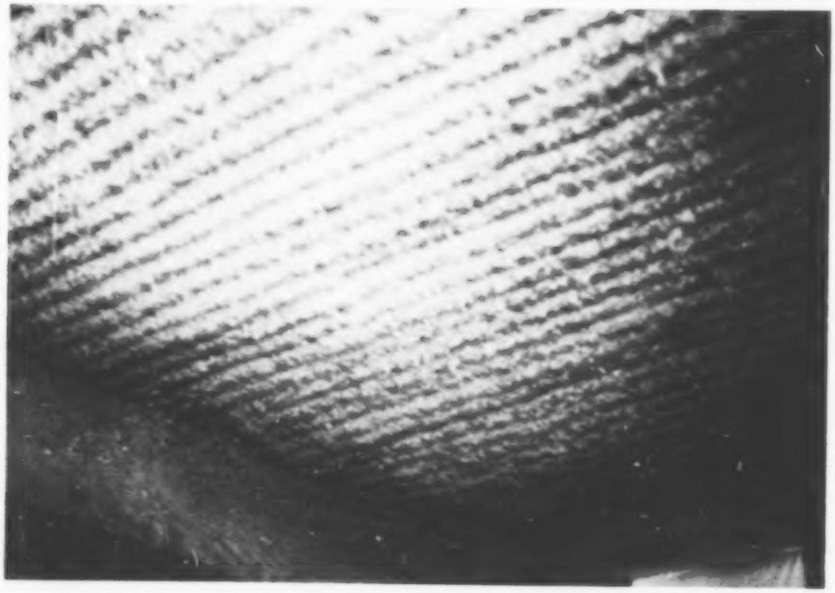
IN PATH OF AIR MOVING SYSTEM

Is the material located directly in an air stream of a ventilation or heating system? Does an air current flow directly over the surface of the material?

(1) Yes.



(2) No.

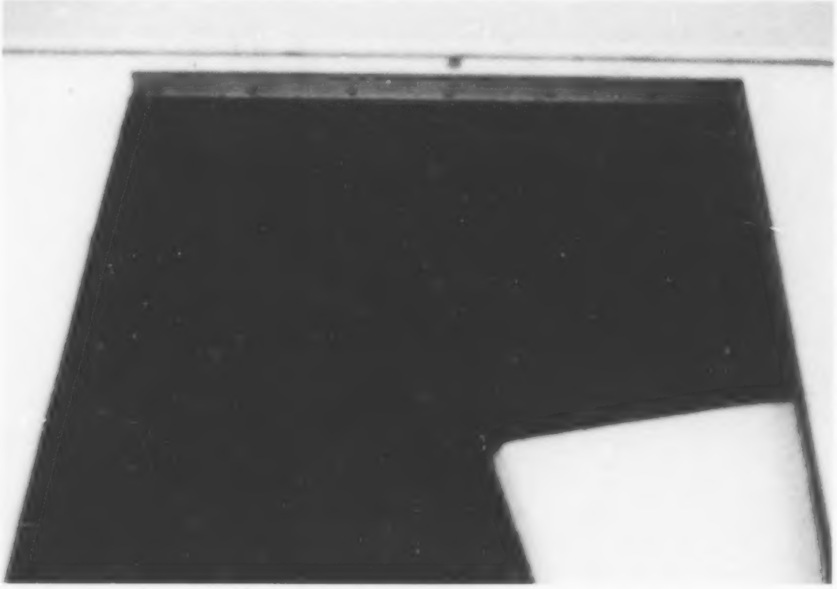


EXPOSED SURFACE AREA

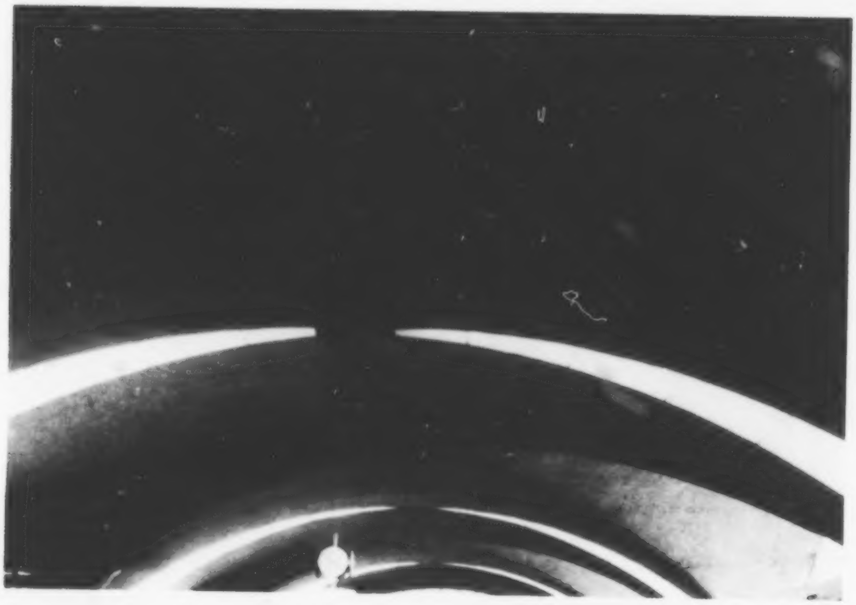
If the material is visible, it is exposed. If the material is located above a suspended ceiling, it is not considered exposed. If, however, the panels of the suspended ceiling are removed or damaged, the material is considered exposed. What percentage of the material is exposed?

(1) Material is not exposed.

(2) 10% or less of the material is exposed.



(3) Greater than 10% of the material is exposed.



WATER DAMAGE

Has the material been damaged by water? To determine the extent of water damage, consider two questions:

- What percentage of the material is water damaged?
- Has water merely stained the material and caused it to buckle, or has water dislodged the material and caused it to break off?

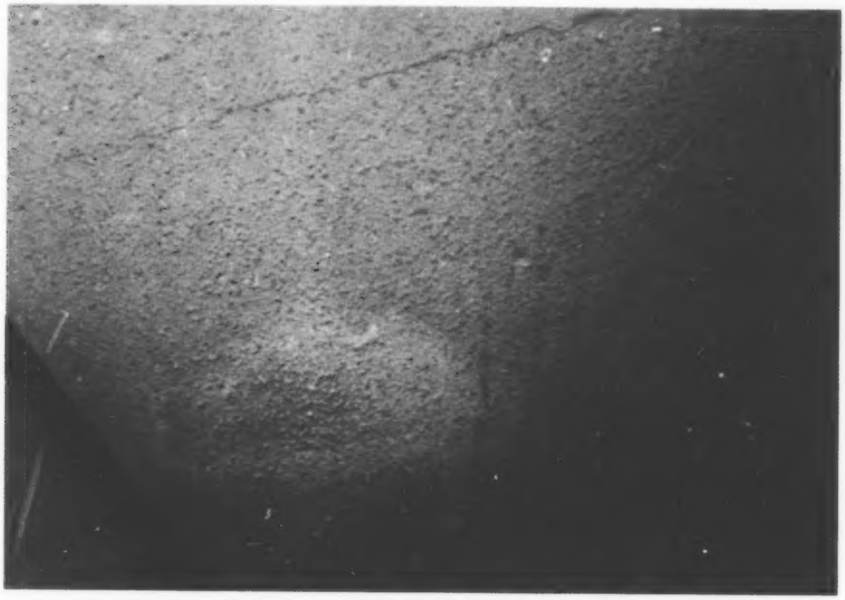
Based on these two questions, score the water damage to the material as follows:

(1) No Water Damage.

(2) Minor Water Damage--10% or less of the material is water damaged,

and

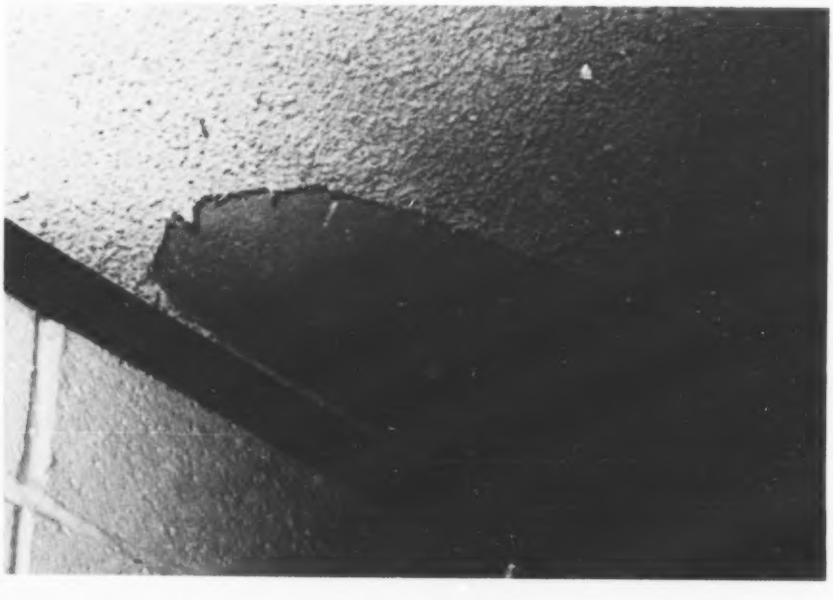
the material is stained or buckling but not dislodged.



(3) Moderate or Major Water Damage--Greater than 10% of the material has any kind of water damage,

and/or

water has dislodged the material, and pieces of the material have broken off.



ACTIVITY OR MOVEMENT

To evaluate the level of activity in the area of the material, consider air movement, building vibration from machinery or other sources, and the activity levels of building occupants and maintenance workers. Score the activity level as follows:

(1) None or Low Activity Level--The activity in the area of the material does not result in building vibration or in contact and damage to the material. Libraries and administration offices usually have low activity levels.

(2) Moderate Activity Level--The activity in the area of the material may lead to building vibration or contact with the material. The damage from contact to the material, however, is minimal.

(3) High Activity Level--The activity in the area of the material causes building vibration or contact and damage to the material. All gymnasiums and rooms that contain machinery have high activity levels.

SCORING SHEET

BLDG NO. ________ 1-5

SITE NO. ________ 6-10

CONDITION __________ 22

1. No Damage
2. Moderate Damage
3. Severe Damage

ACCESSIBILITY __________ 24

1. Not Accessible
2. Rarely Accessible
3. Accessible

FRIABILITY __________ 26

1. Not Friable
2. Low Friability
3. Moderate Friability
4. High Friability

IN PATH OF AIR MOVING SYSTEM __________ 28

1. Yes
2. No

EXPOSED SURFACE AREA __________ 30

1. Material is not exposed.
2. 10% or less of the material is exposed.
3. Greater than 10% of the material is exposed.

WATER DAMAGE __________ 32

1. No Water Damage
2. Minor Water Damage
3. Moderate or Major Water Damage

ACTIVITY OR MOVEMENT __________ 34

1. None or Low Activity Level
2. Moderate Activity Level
3. High Activity Level

RATER CODE __________ 40

Computation of Exposure Score

(1) Determine the weights for each of the seven factors.

(2) Using the weighted factor scores, compute

SUM = CONDITION + ACCESSIBLITY + AIR MOVING
SYSTEM + EXPOSURE + WATER DAMAGE
+ ACTIVITY.

(3) Multiply SUM by the weighted factor score for FRIABILITY and the weighted factor score for percent of asbestos.

EXPOSURE SCORE = SUM x FRIABILITY x PERCENT ASBESTOS.

TABLE A-2. FACTOR WEIGHTS FOR REVISED RATING FORM

Factor	Unweighted Scores	Weighted Scores
Condition		
No Damage	1	0
Moderate Damage	2	2
Severe Damage	3	5
Accessibility		
Not Accessible	1	0
Rarely Accessible	2	1
Accessible	3	3
Part of Air Moving System		
No	2	0
Yes	1	1
Exposure		
Material is not exposed	1	0
10 percent or less of the material is exposed	2	1
Greater than 10 percent of the material is exposed	3	4
Water Damage		
No water damage	1	0
Minor water damage	2	1
Moderate or major water damage	3	2
Activity or Movement		
None or low activity level	1	0
Moderate activity level	2	1
High activity level	3	2
Friability		
Not Friable	1	0
Low Friability	2	1
Moderate Friability	3	2
High Friability	4	3
Percentage Asbestos		
Less than or equal to 1 percent	-	0
Greater than 1 percent and less than or equal to 50 percent	-	2
Greater than 50 percent	-	3

APPENDIX B

DATA

BUILDING DATA

Bulk-Sampling Results Expressed As Percentages

Rating-Form/Air-Sampling Results

APPENDIX B

TABLE B-1. BUILDING DATA

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
06	01	Classroom	06-01A	granular	0	50	0	--	--	--	present	--	--	--	paint
			06-01B	granular	0	10	0	--	--	--	present	--	--	--	paint
06	02	Hall	06-02A	granular	0	5	0	--	--	--	present	--	--	--	paint
			06-02B	granular	0	5	0	--	--	--	present	--	--	--	paint, glass
06	near site 2		6-SV3A	granular	0	2	0	--	--	--	present	--	--	--	paint
06	near site 2		6-SV3B	granular	0	2	0	--	--	--	present	--	--	--	paint

SAMPLING SITE IDENTIFICATION			TYPE OF RATER	UNWEIGHTED FACTOR SCORES							Average % Asbestos	Exposure Score	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION		Condition	Access	Friability	Air	Expose	Water	Activity			PM	FAM	PM	FAM
06	01	1	5	4	2	3	2	3	3	2	30	52	0	.13	--	8.59
			4	3	2	2	2	3	3	3		22		.12		13.16
			4	4	2	3	2	3	3	3		56		.10		11.47
			4	3	2	3	2	3	3	2		40		.17		
			4	3	2	3	2	3	2	2		36		.05		
			4	3	2	4	2	3	3	2		60		.15		
06	02	1	5	3	2	2	2	3	3	3	5	22	0	.09	--	2.96
			4	2	2	2	2	3	2	3		20		.07		2.48
			4	4	3	4	2	3	3	3		96		.06		4.76
			4	4	3	4	1	3	3	3		102		.09		
			4	4	3	2	1	3	3	3		34		.07		
			4	3	2	3	1	3	2	2		40		.10		

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
07	01	Hall	7-01A	granular	0	5	0	--	--	--	--	--	--	--	paint
			7-01B	granular	0	10	0	--	--	--	--	--	--	--	paint
07	02	Cafeteria	7-02A	granular	0	5	0	--	--	--	--	--	--	--	paint
			7-02B	granular	0	5	0	--	--	--	--	--	--	--	paint
07	03	Classroom	7-03A	granular	0	5	0	--	--	--	--	--	--	--	paint
			7-03B	granular	0	10	0	--	--	--	--	--	--	--	paint

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
		SAMPLING											Normal		With Vibrator	
BLDG	SITE	LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
07	01	1	5	2	2	2	2	3	2	3	8	20	0	.09	--	34.19
			4	2	1	2	1	3	2	2		18		.36		26.52
			4	2	1	2	1	3	2	2		18		.19		18.45
			4	2	3	2	1	3	2	3		26		.06		
			4	1	2	1	1	3	1	3		0		.16		
			4	2	1	2	2	3	2	1		14		.07		
07	02	1	5	2	2	1	2	3	2	2	5	0	0	.05	--	30.50
			4	2	3	3	2	3	2	2		44		.02		19.38
			4	2	3	3	1	3	2	3		52		.03		11.37
			4	2	3	3	1	3	2	3		52		.03		
			4	2	3	3	1	3	2	3		52				
			4	3	1	3	2	3	2	2		32				
07	03	1	5	2	2	2	2	3	2	2	8	18	.03	.12	--	31.17
			4	3	2	2	2	3	2	2		18		.09		17.48
			4	2	3	4	1	3	2	1		66		.08		11.24
			4	2	2	2	1	3	2	1		18		.05		
			4	2	1	2	2	1	2	1		6		.02		
			4	1	2	2	1	3	2	1		14		.01		

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
08	01	Metal Shop	08-01A	fibrous	75	0	0	--	--	--	present	--	--	--	glass
			08-01B	fibrous	75	--	0	--	--	--	present	--	--	--	glass
08	02	Art Room	08-02A	fibrous	30	0	0	--	--	--	present	--	--	--	glass
			08-02B	fibrous	30	0	0	--	--	--	present	--	--	--	glass
08	03	Offices	08-03A	cemented granules	0	1	0	--	--	--	--	--	--	--	glass
			08-03B	cemented granules	0	1	0	--	--	--	--	--	--	--	glass
08	04	Choir Room	08-04A	fibrous	30	0	0	--	--	--	--	--	--	--	glass
			08-04B	fibrous	30	0	0	--	--	--	--	--	--	--	glass
8	05	Gym	08-05A	fibrous	30	0	0	--	--	--	--	--	present	--	glass
			08-05B	fibrous	30	0	0	--	--	--	--	--	present	--	glass
08	06	Auto Shop	08-06A	fibrous	30	0	0	--	--	--	--	--	present	--	glass
			08-06B	fibrous	30	0	0	--	--	--	--	--	present	--	glass
08	near site 5		08-SV1A	fibrous	40	0	0	--	--	--	--	--	present	--	glass
08	near site 5		08-SV1B	fibrous	30	5	0	--	--	--	--	--	present	--	glass

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
08	near site 5		08-SV2A	fibrous	30	1	0	--	--	--	--	--	present	--	glass
08	near site 5		08-SV2B	fibrous	40	5	0	--	--	--	--	--	present	--	glass
08	near site 5		08-SV3A	fibrous	40	2	0	--	--	--	--	--	present	--	glass
08	near site 5		08-SV3B	fibrous	40	5	0	--	--	--	--	--	present	--	glass

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
08	01	1	5	4	2	3	2	3	3	3	75	84	.17	.02	269.9	--
			5	4	3	4	2	3	3	3		144		.05		
			4	2	3	3	2	3	2	2		66		.03		
			4	3	3	4	2	3	2	3		108				
			4	3	2	4	1	3	2	3		99				
			4	4	3	3	2	3	1	2		78				
			4	3	3	4	2	3	2	3		108				
			4	3	3	4	2	3	1	2		90				
08	02	1	5	4	2	3	2	3	1	2	30	44	.06	.10	560.6	37.3
			5	3	2	3	2	3	2	1		32		.11		57.5
			4	3	3	4	2	3	1	3		66		.08		46.4
			4	3	2	3	2	3	2	3		40				
			4	3	3	4	2	3	2	2		66				
			4	3	3	4	1	3	2	2		72				
			4	2	2	4	2	3	2	1		48				
08	03	1	5	1	2	1	2	3	1	2	1	0	.03	.03	3.5	.7
			5	1	2	2	2	3	1	1		0		.07		.5
			4	1	1	1	2	1	1	1		0		.08		.6
			4	1	2	1	2	3	1	2		0				
			4	1	3	2	2	1	1	2		0				

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
			4	1	3	1	1	3	1	3		0				
			4	2	1	1	2	1	1	2		0				
08	04	1	5	2	2	2	2	3	1	2	30	16	.03	.23	28.2	18.5
			5	2	2	3	2	3	2	2		36		.20		10.4
			4	2	3	3	2	3	1	2		40		.20		
			4	2	2	2	2	3	2	2		18		.11		
			4	3	3	3	1	3	1	3		48		.06		
			4	2	2	4	2	3	1	2		48		.06		
			4	4	3	4	2	3	2	2		84				
08	05	1	5	4	2	3	2	3	3	3	30	56	.04	.03	62.5	29.3
			5	4	2	3	2	2	3	3		44		.02		30.7
			4	4	2	3	2	3	2	2		48		.02		
			4	4	3	4	2	3	3	3		96		.02		
			4	3	3	3	2	3	3	2		48		.03		
			4	3	2	3	2	3	2	2		36		.03		
			4	4	3	4	2	3	3	3		96				
08	06	1	5	2	2	3	2	3	1	2	30	32	.04	.07	232.0	48.6
			5	3	2	3	2	3	2	3		40		.24		50.8
			4	3	3	3	2	3	1	3		44		.07		
			4	2	2	3	2	3	2	2		36		.07		

SAMPLING SITE IDENTIFICATION			TYPE OF RATER	UNWEIGHTED FACTOR SCORES							Average % Asbestos	Exposure Score	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION		Condition	Access	Friability	Air	Expose	Water	Activity			PM	FAM	PM	FAM
			4	2	3	2	2	3	2	2		22		.04		
			4	3	3	4	1	3	1	3		72		.06		
			4	3	3	3	1	3	2	2		48				

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
09	01	Classroom	09-01A	granular	0	5	0	--	--	--	--	--	--	--	glass
					and 5% anthrophyllite										
			09-01B	granular	0	5	0	--	--	--	--	--	--	--	glass
					and 5% anthrophyllite										
09	02	Classroom	09-02A	granular	0	5	0	--	--	--	--	--	--	--	glass
					and 5% anthrophyllite										
			09-02B	granular	0	5	0	--	--	--	--	--	--	--	glass
					and 5% anthrophyllite										
09	03	Library	09-03A	granular	0	5	0	--	--	--	--	--	--	--	glass
					and 5% anthrophyllite										
			09-03B	granular	0	5	0	--	--	--	--	--	--	--	glass
					and 5% anthrophyllite										
09	near site 3		09-SV1A	granular	0	5	0	--	--	--	present	--	--	--	glass
09	near site 3		09-SV1B	granular	0	1	0	--	--	--	present	--	--	--	glass
09	near site 3		09-SV2A	granular	0	2	0	--	--	--	present	--	--	--	glass
09	near site 3		09-SV2B	granular	0	5	0	--	--	--	present	--	--	--	glass
					and 5% anthrophyllite										

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
09	01	1	5	2	2	1	2	3	1	1	10	0	.04	.10	6.1	80.9
			5	2	2	2	2	3	2	1		16		.14		58.5
			4	1	2	2	1	3	1	1		12		.11		
			4	2	2	2	2	3	2	2		18		.16		
			4	1	2	4	1	2	1	1		18		.10		
			4	1	2	4	1	2	1	1		18		.15		
09	02	1	5	1	2	1	2	3	1	2	10	0	.19	.04	9.9	42.2
			5	2	2	2	2	3	2	1		16		.17		29.1
			4	2	2	2	2	3	2	2		18		.11		
			4	4	3	3	1	3	3	1		60		.08		
			4	2	2	4	1	2	2	1		36		.03		
			4	2	2	4	1	2	2	1		36		.04		
09	03	1	5	2	2	2	2	3	2	1	10	16	0	.04	57.2	37.6
			5	2	2	1	2	3	2	1		0		.02		29.0
			4	2	2	3	2	3	2	1		32		.05		
			4	2	2	2	2	3	2	2		18		.04		
			4	2	2	1	2	3	2	1		0		.02		
			4	2	2	4	1	2	2	1		36		.03		
			4	2	2	4	1	2	2	1		36				

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
10	01	Hall	10-01A	fibrous	0	70	0	--	--	--	--	--	--	--	paint
			10-01B	fibrous	0	70	0	--	--	--	--	--	--	--	paint
10	02	Cafeteria	10-02A	fibrous	0	70	0	--	--	--	--	--	--	--	glass
			10-02B	fibrous	0	70	0	--	--	--	--	--	--	--	paint
10	near site 2		10-SV3A	fibrous	5	70	0	--	--	--	--	--	--	--	paint
10	near site 2		10-SV3B	fibrous	5	40	0	--	--	--	--	--	--	--	paint

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
			TYPE OF								Average %	Exposure	Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
10	01	1	5	3	2	3	2	3	1	1	70	42	0	.07	36.0	26.5
			5	3	3	3	2	3	1	1		54		.06		17.5
			4	3	2	4	2	3	1	2		72		.01		
			4	3	3	4	1	3	2	2		108		.03		
			4	3	2	4	2	3	1	2		72		.04		
														.06		
10	02	1	5	2	2	3	2	3	1	2	70	48	.04	.10	63.6	63.0
			5	2	2	3	2	3	1	3		54		.11		62.2
			4	2	2	1	2	3	1	2		0		.07		
			4	2	3	3	1	3	2	3		78		.15		
			4	4	2	2	2	3	1	2		33		.05		

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content Amosite	Chrysotile	Crocidolite	Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
11	01	Hall	11-01A	fibrous	5	40	0	--	--	--	present	--	--	--	glass
			11-01B	fibrous	5	40	0	--	--	--	present	--	--	--	glass
11	02	Lounge	11-02A	fibrous	10	40	0	--	--	--	present	--	--	--	glass
			11-02B	fibrous	10	40	0	--	--	--	present	--	--	--	glass
11	near site 2		11-SV3A	fibrous	10	60	0	--	--	--	present	--	--	--	glass
11	near site 2		11-SV3B	fibrous	4	70	0	--	--	--	present	--	--	--	glass

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
11	01	1	5	3	2	3	2	3	1	2	45	32	.01	.07	104.7	36.6
			5	4	2	4	2	3	1	2		66		.04		60.1
			4	3	3	4	1	3	2	2		72		.02		
			4	2	3	3	2	3	1	3		44		.16		
			4	3	3	3	2	3	1	3		44		.10		
			4	4	3	2	2	3	2	3		30		.09		
11	02	1	5	4	3	3	1	3	1	3	50	60	.03	.05	61.9	41.5
			5	4	2	4	1	3	1	3		78		.08		33.9
			4	4	3	3	2	3	2	3		60		.07		
			4	4	3	4	1	3	2	3		96		.20		
			4	3	3	3	1	3	2	3		52		.24		
			4	3	3	4	2	3	2	3		72		.22		

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
14	01	Cafeteria	14-01A	--	40	20	0	0	trace	0	8	30	trace	0	trace glass chips
			14-01B	--	60	0	0	0	trace	0	4	30	1	0	5% glass chips
14	02	Classroom	14-02A	--	50	0	0	0	1	0	4	40	1	0	4% glass chips
			14-02B	--	60	0	0	0	0	0	4	30	2	0	4% glass chips
14	03	Hall	14-03A	--	30	0	0	0	5	0	5	50	5	0	5% glass chips
			14-03B	--	60	0	0	0	trace	0	4	30	1	0	5% glass chips
14	near site 3		14-SV1	fibrous	50	0	0	0	trace	0	10	30	5	0	5% glass chips
14	near site 3		14-SV2	--	40	0	0	0	5	0	5	50	5	0	5% glass chips

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
14	01	1	1	2	2	3	2	3	1	2	60	48	--	0.0	117.0	--
			2	2	2	1	2	1	2	3		0		0.0	261.9	
			2	1	2	2	2	3	1	2		18			114.4	
			3	2	2	3	2	3	1	2		48				
			3	3	2	3	2	3	1	2		66				
			3	3	2	4	2	3	1	3		108				
			3	2	2	4	2	3	1	3		31				
			3	3	2	4	2	3	1	2		99				
14.	02	1	1	2	1	3	2	3	1	1		36	--	0.0	238.2	--
			2	1	2	1	2	2	1	2	55	0		0.0	266.8	
			2	2	2	2	2	3	1	1		21			174.8	
			3A	2	2	3	2	3	1	2		48				
			3B	3	2	3	2	3	2	2		72				
			3C	2	2	4	2	3	1	2		72				
			3D	3	2	4	2	3	1	2		99				
			3E	3	2	4	2	3	2	2		108				
14	03	1	1	2	2	3	2	3	1	1	45	28	--	--	181.9	--
			2	2	2	2	2	1	1	3		10			123.8	
			2	2	2	2	2	3	2	1		16			311.4	
			3	3	2	3	2	3	3	2		52				

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLINC LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
			3	3	2	3	2	3	2	2		48				
			3	2	2	4	2	3	3	3		66				
			3	3	2	4	2	3	3	2		78				
			3	3	2	4	2	3	2	2		72				

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
15	01	Hall	15-01A(a)	--	90	0	0	5	0	0	0	2	3	0	--
			15-01B(a)		80	0	0	0	0	0	10	0	5	0	5% glass chips
			15-01C		50	0	0	0	0	0	10	30	5	0	5% glass chips
			15-01D		40	0	0	0	0	0	20	30	10	0	5% glass chips
15	03	Classroom	15-03A		20	0	0	10	0	0	40	20	10	0	--
			15-03B		40	5	0	20	0	0	0	30	trace	0	5% glass chips
15	near site 3		15-SV1		40	0	0	15	0	0	0	40	2	0	3% glass chips
15	near site 3		15-SV2		50	0	0	15	0	0	0	25	5	0	5% glass chips

(a) Samples collected from water-damaged area.

SAMPLING SITE IDENTIFICATION			TYPE OF RATER	UNWEIGHTED FACTOR SCORES							Average % Asbestos	Exposure Score	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION		Condition	Access	Friability	Air	Expose	Water	Activity			PM	FAM	PM	FAM
15	01	1	1	3	2	3	2	3	2	2	45	48	--	--	121.9	--
			2	2	3	3	2	3	2	3		48			88.7	
			2	3	3	3	1	3	1	3		60			172.5	
			3	3	3	3	2	3	1	3		56				
			3	3	2	4	2	3	1	2		66				
			3	3	2	4	2	3	1	3		72				
			3	3	3	4	2	3	1	3		84				
			3	3	2	4	2	3	1	2		66				
15	01	2[(a)]	1	3	2	3	2	3	2	2	85	72	--	--	209.1	--
			2	2	3	3	2	3	2	3		72			257.8	
			2	3	3	3	1	3	1	3		90			249.1	
			3	3	3	3	2	3	1	3		84				
			3	3	2	4	2	3	1	2		99				
			3	3	2	4	2	3	1	3		108				
			3	3	3	4	2	3	1	3		126				
			3	3	2	4	2	3	1	2		99				
15	03	1	1	3	2	3	2	3	1	1	33	40	--	--	180.4	--
			2	2	2	2	2	3	2	2		18			276.3	
			2	2	2	3	1	3	1	2		36			12.8	
			3A	3	2	3	2	3	1	1		40				

(a) This site is a water-damaged area. Rating form data, bulk sampling data and vibrator data were collected at the water-damaged area.

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
			3B	3	2	4	2	3	1	2		66				
			3C	3	2	4	2	3	1	1		60				
			3D	3	3	4	2	3	1	1		72				
			3E	3	2	4	2	3	1	1		60				

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
16	01	Entrance Hall	16-01A	granular	0	10	0	40	0	0	0	0	50	0	--
			16-01B	granular	0	5	0	50	5	0	0	0	40	0	--
16	02	Hall	16-02A[(a)]	granular	0	0	0	20	0	0	0	20	60	0	--
			16-02B[(a)]	granular	0	5	0	45	0	0	0	0	50	0	--
			16-02C	granular	0	10	0	50	0	0	0	0	40	0	--
			16-02D	chucky granular	0	10	0	30	0	10	0	0	50	0	--
16	03	Music Practice Room	16-03A	granular	0	10	0	25	5	10	0	0	50	0	--
			16-03B	granular	0	10	0	40	0	10	0	0	40	0	--
16	04	Cafeteria	16-04A	granular	0	5	0	35	0	10	0	0	50	0	--
			16-04B	granular	0	5	0	25	0	10	0	0	60	0	--
16	near site 1		16-SV1	granular	0	10	0	50	0	0	0	0	40	0	--
16	near site 1		16-SV2	granular	0	10	0	30	5	0	0	0	50	0	--

(a) Samples collected from water-damaged area.

SAMPLING SITE IDENTIFICATION			TYPE OF RATER	UNWEIGHTED FACTOR SCORES							Average % Asbestos	Exposure Score	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION		Condition	Access	Friability	Air	Expose	Water	Activity			PM	FAM	PM	FAM
16	01	1	1	2	2	2	2	3	1	3	7.5	18	--	--	6.0	--
			2	1	2	2	2	3	1	1		10			3.0	
			2	1	1	2	2	3	1	1		8			0.4	
			2	1	2	2	2	3	1	2		12				
			2	1	2	2	2	3	1	2		12				
			2	1	2	1	2	3	1	2		0				
			3	1	2	2	2	3	1	2		12				
			3	2	2	2	2	3	1	2		16				
			3	2	2	2	2	3	2	2		18				
			3	2	2	3	2	3	1	3		36				
			3	2	2	3	2	3	3	2		40				
16	02	1	1	3	2	2	2	3	3	2	10	26	--	--	1.1	--
			2	2	2	2	2	3	2	2		18			0	
			2	1	3	2	2	3	1	1		14			1.9	
			2	2	2	3	2	3	2	3		40				
			2	2	2	2	2	3	1	2		16				
			2	2	3	1	2	3	1	2		0				
			3	2	3	2	2	3	3	3		26				
			3	3	3	2	2	3	3	3		32				
			3	3	3	2	2	3	3	3		32				

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
			3	3	3	3	2	3	3	3		64				
			3	3	2	2	2	3	3	3		28				
16	02	2[a]	1	3	2	2	2	3	3	2	2.5	26	--	--	0	--
			2	2	2	2	2	3	2	2		18			0	
			2	1	3	2	2	3	1	1		14			0	
			2	2	2	3	2	3	2	3		40				
			2	2	2	2	2	3	1	2		16				
			2	2	3	1	2	3	1	2		0				
			3	2	3	2	2	3	3	3		26				
			3	3	3	2	2	3	3	3		32				
			3	3	3	2	2	3	3	3		32				
			3	3	3	3	2	3	3	3		64				
			3	3	2	2	2	3	3	3		28				
16	03	1	1	2	2	2	2	3	1	2	10	16	--	--	2.3	--
			2	1	2	2	2	3	1	2		12			0	
			2	1	2	2	2	3	1	1		10			0	
			2	1	1	2	2	3	1	1		8				
			2	1	2	2	2	3	1	2		12				
			2	1	2	1	2	3	1	1		0				
			3	2	2	3	2	3	1	2		32				

(a) This site is a water-damaged area. Rating form data, bulk sampling data and vibrator data were collected at the water-damaged area.

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
			3	2	2	2	2	3	1	2		16				
			3	2	2	2	2	3	1	1		14				
			3	2	2	2	2	3	1	1		14				
			3	2	2	2	2	3	1	1		14				
16	04	1	1	2	2	2	2	3	3	3	5	22	--	--	3.0	--
			2	1	2	2	2	3	2	2		14			1.1	
			2	1	2	2	2	3	1	2		12			1.9	
			2	1	2	2	2	3	1	2		12				
			2	1	2	2	2	3	2	1		10				
			2	2	2	1	2	3	2	2		0				
			3	3	2	2	2	3	2	2		24				
			3	2	2	2	2	3	2	2		18				
			3	2	2	2	2	3	2	3		20				
			3	2	2	2	2	3	3	3		22				
			3	2	2	2	2	3	3	2		20				
16	05	1	--	--	--	--	--	--	--	--	--	--	0.8*			

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* Fibers are not asbestos fibers.

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
17	01	Classroom	17-01A	fibrous	0	0	0	0	0	0	30	0	10	60	--
			17-01B	fibrous	0	0	0	0	0	0	20	0	20	60	--
17	02	Art Room	17-02A	fibrous	0	0	0	0	0	0	20	0	10	70	--
			17-02B	fibrous	0	0	0	0	0	0	20	0	20	60	--
17	03	Hall	17-03A	fibrous	0	0	0	0	0	0	40	0	10	50	--
			17-03B	fibrous	0	0	0	0	0	0	20	0	20	60	--
17	near site 3		17-SV1	fibrous	0	0	0	0	0	0	20	0	20	60	--
17	near site 3		17-SV2	fibrous	0	0	0	0	0	0	30	0	10	60	--

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
17	01	1	1	3	2	3	2	3	3	2	0	0	--	0.0	2.3	--
			2	2	1	2	2	3	3	2		0			1.5	
			2	2	2	3	2	3	2	2		0			1.9	
			2	2	1	2	2	2	2	2		0				
			2	2	2	2	2	3	3	2		0				
			3	3	2	4	2	3	3	2		0				
			3	3	2	3	2	3	3	2		0				
			3	3	2	3	2	3	3	2		0				
			3	3	2	3	2	3	3	2		0				
			3	3	2	3	2	3	3	2		0				
17	02	1	1	3	2	3	2	3	2	2	0	0	--	0.01	0.8	--
			2	2	1	2	2	2	3	1		0			4.5	
			2	2	2	3	2	3	2	3		0			1.1	
			2	2	1	2	2	2	2	1		0				
			2	3	3	2	2	3	3	2		0				
			3	3	3	4	2	3	3	2		0				
			3	3	2	3	2	3	2	2		0				
			3	3	2	3	2	3	3	2		0				
			3	3	2	4	2	3	3	3		0				
			3	3	2	3	2	3	2	2		0				

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
		SAMPLING											Normal		With Vibrator	
BLDG	SITE	LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
17	03	1	1	3	3	3	2	3	1	2	0	0	--	0.01	0	--
			2	2	2	3	2	3	1	2		0			0.8	
			2	2	1	2	2	1	1	2		0			1.9	
			2	2	1	1	2	1	1	2		0				
			2	2	1	2	2	1	1	1		0				
			3	3	3	4	2	3	1	3		0				
			3	3	3	3	2	3	1	3		0				
			3	3	2	3	2	3	1	3		0				
			3	3	3	3	2	3	1	3		0				
			3	3	2	3	2	3	1	2		0				

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
18	01	Entrance Hall	18-01A	granular with fibers	0	5	0	45	0	5	0	0	40	5	--
			18-01B	granular with fibers	0	20	0	50	trace	0	0	0	30	0	--
18	02	Hall	18-02A	fibers/ powder	0	20	0	40	0	5	0	0	35	0	--
			18-02B	granular	0	10	0	40	0	10	0	0	40	0	--

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
18	01	1	1	3	3	2	2	3	1	3	13	28	--	--	0*	--
															0*	
															0*	
18	02	1	1	2	2	2	2	3	3	2	15	20	--	--	0*	--
															0*	
															0*	

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*Too much powder on filters - no fibers visible.

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
19	01	Hall	19-01A	granular	0	10	0	60	0	0	0	0	30	0	--
			19-01B	granular	0	5	0	40	0	0	0	0	55	10	--
19	02	Music Practice Room	19-02A	powder and fibers	0	20	0	40	0	5	0	0	35	0	--
			19-02B	granular with fibers	0	30	0	50	0	0	0	0	20	0	--

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
19	01	1	1	1	3	2	2	3	1	3	7.5	18	--	--	0.4	--
			2	2	2	2	2	3	1	2		16			0*	
			2	2	3	2	2	3	1	2		20			0*	
			2	2	3	1	2	3	1	3		0				
			2	2	3	1	2	3	1	3		0				
			2	2	3	1	2	3	1	3		0				
			3	2	3	1	2	3	1	3		0				
			3	2	3	2	2	3	1	3		22				
			3	2	3	2	2	3	1	3		22				
			3	2	3	2	2	3	1	3		22				
			3	2	3	2	2	3	1	3		22				
			4	2	3	2	2	2	1	3		16				
			4	2	3	2	2	3	1	3		22				
			4	2	3	2	2	3	1	3		22				
			4	2	3	2	2	3	1	3		22				
			4	1	3	2	2	3	1	2		16				
			2	1	3	1	2	3	1	3		0				

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*Too much powder on filters - fibers not visible.

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
19	02	1	1	2	3	2	1	3	1	3	25	24	0*	--	1.5	--
			2	2	3	3	2	3	1	2		40			1.9	
			2	1	3	1	2	3	1	2		0			1.1	
			2	2	3	1	2	3	1	2		0				
			2	2	3	1	2	3	1	2		0				
			2	2	3	2	2	2	1	2		14				
			3	3	3	2	2	3	1	3		28				
			3	3	3	2	2	3	1	3		28				
			3	2	3	2	2	3	1	2		20				
			3	3	3	2	2	3	1	2		26				
			3	3	3	2	2	3	1	2		26				
			4	2	3	2	2	2	1	1		12				
			4	2	3	3	2	3	1	1		36				
			4	2	3	2	2	3	1	1		18				
			4	2	3	2	2	3	1	1		18				
			4	2	3	2	2	2	1	1		12				
			2	2	3	1	2	3	1	2		0				

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*Too much powder on filter - no fibers visible.

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
20	01	Band Room	20-01A	granular	0	0	0	0	0	0	20	0	20	10	50% glass chips
			20-01B	granular	0	0	0	0	0	0	30	0	10	10	50% glass chips
20	02	Art Room	20-02A	granular	0	0	0	0	0	0	20	0	10	20	50% glass chips
			20-02B	granular	0	5	0	0	0	0	40	0	20	5	30% glass chips
20	03	Music Room	20-03A	granular[(a)]	0	0	0	0	0	0	30	0	10	10	50% glass chips
			20-03B	granular[(a)]	0	0	0	0	0	0	30	0	10	20	40% glass chips
			20-03C	granular	0	0	0	0	0	0	20	0	10	20	50% glass chips
			20-03D	granular	0	5	0	0	0	0	25	0	10	10	50% glass chips
20	04	Classroom	20-04A	granular	0	0	0	0	0	0	25	0	10	10	55% glass chips
			20-04B	chunky	0	0	0	0	0	0	40	0	15	5	40% glass chips
20	near site I		20-SV1	granular	0	0	0	0	0	0	45	0	15	10	30% glass chips
20	near site I		20-SV2	granular	0	0	0	0	0	0	30	0	10	10	50% glass chips

(a) Samples collected from water-damaged area.

SAMPLING SITE IDENTIFICATION			TYPE OF RATER	UNWEIGHTED FACTOR SCORES							Average % Asbestos	Exposure Score	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION		Condition	Access	Friability	Air	Expose	Water	Activity			PM	FAM	PM	FAM
20	01	1	1	3	2	2	1	3	3	3	0	0	--	--	0.8	--
			2	1	2	1	1	3	3	2		0			0.8	
			2	2	2	1	1	3	3	2		0			0	
			2	2	2	1	1	3	3	1		0				
			2	2	2	1	1	3	3	2		0				
			2	2	2	2	1	3	3	2		0				
			3	3	2	3	1	3	3	3		0				
			3	3	2	2	1	3	3	3		0				
			3	3	2	2	1	3	3	3		0				
			3	3	2	2	1	3	3	2		0				
			3	3	2	2	1	3	3	3		0				
			4	2	2	1	2	2	2	1		0				
			4	2	2	4	2	2	2	1		0				
			4	2	2	4	2	2	2	1		0				
			4	4	2	4	2	2	3	2		0				
			4	2	2	1	2	3	2	1		0				
20	02	1	1	2	2	2	1	3	3	2	2.5	22	--	--	0	--
			2	1	2	1	1	3	1	1		0			1.1	
			2	1	2	1	1	3	1	1		0			0	
			2	1	2	1	1	3	1	2		0				
			2	1	2	1	1	3	1	1		0				

SAMPLING SITE IDENTIFICATION			TYPE OF RATER	UNWEIGHTED FACTOR SCORES							Average % Asbestos	Exposure Score	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION		Condition	Access	Friability	Air	Expose	Water	Activity			PM	FAM	PM	FAM
			2	2	2	2	1	3	3	1		20				
			3	3	2	2	1	3	3	2		28				
			3	3	2	2	1	3	3	2		28				
			3	3	2	2	1	3	3	2		28				
			3	3	2	2	1	3	3	3		30				
			3	3	2	2	1	3	3	2		28				
			4	2	2	1	2	2	2	1		0				
			4	2	2	4	2	2	2	1		30				
			4	2	2	1	2	2	2	2		0				
			4	1	2	1	2	3	2	1		0				
			4	2	2	4	2	2	2	1		30				
20	03	1	1	3	2	2	1	3	3	3	2.5	30	--	--	0	--
			2	1	2	1	1	3	3	2		0			0*	
			2	1	2	1	1	3	3	2		0			1.5	
			2	1	2	1	1	3	2	2		0				
			2	1	2	1	1	3	3	1		0				
			2	2	2	2	1	3	3	2		22				
			3	3	2	3	1	3	3	2		56				
			3	3	2	2	1	3	3	3		30				

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*Too much powder on filter - no fibers visible.

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
			3	3	2	2	1	3	3	2		23				
			3	3	2	2	1	3	3	3		30				
			3	3	2	2	1	3	3	2		28				
			4	2	2	1	2	2	2	1		0				
			4	2	2	2	2	2	2	1		10				
			4	2	2	2	2	2	2	1		10				
			4	2	2	2	2	2	3	1		12				
			4	2	2	2	2	3	2	1		16				
20	03	2[a]	1	3	2	2	1	3	3	3	0	0	--	--	1.1	--
			2	1	2	1	1	3	3	2		0			0	
			2	1	2	1	1	3	3	2		0			0	
			2	1	2	1	1	3	2	2		0				
			2	1	2	1	1	3	3	1		0				
			2	2	2	2	1	3	3	2		0				
			3	3	2	3	1	3	3	2		0				
			3	3	2	2	1	3	3	3		0				
			3	3	2	2	1	3	3	2		0				
			3	3	2	2	1	3	3	3		0				
			3	3	2	2	1	3	3	2		0				
			4	2	2	1	2	2	2	1		0				

(a) This site is a water-damaged area. Rating form data, bulk sampling data and vibrator data were collected at the water-damaged area.

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
			4	2	2	2	2	2	2	1		0				
			4	2	2	2	2	2	2	1		0				
			4	2	2	2	2	2	3	1		0				
			4	2	2	2	2	3	2	1		0				
20	04	1	1	3	2	2	1	3	3	2	0	0	--	--	0*	--
			2	1	2	1	1	3	3	1		0			7.2	
			2	1	2	1	1	3	3	2		0			0	
			2	1	2	1	1	3	2	2		0				
			2	1	2	1	1	3	2	1		0				
			2	1	2	2	1	3	3	1		0				
			3	3	2	2	1	3	3	2		0				
			3	3	2	2	1	3	3	2		0				
			3	3	2	2	1	3	3	2		0				
			3	2	2	2	1	3	3	3		0				
			3	2	2	2	1	3	3	2		0				
			4	2	2	1	2	2	2	1		0				
			4	2	2	4	2	2	2	1		0				

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*Too much powder on filter - no fibers visible.

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
			4	2	2	4	2	2	2	1		0				
			4	2	2	4	1	3	3	2		0				
			4	2	2	2	2	3	2	1		0				

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
21	01	Boiler Room	21-01A	flaky	0	5	0	--	--	--	--	--	60	--	35% vermiculite
			21-01B	flaky	0	10	0	--	--	--	--	--	60	--	30% vermiculite
		Pipe Insulation	21-01C	powder, no fibers	30	0	0	30	--	--	40	--	--	--	--
		Pipe Insulation	21-01D	powder, no fibers	40	0	0	30	--	--	30	--	--	--	--
21	02	Classroom	21-02A	chunky, granular	0	15	0	--	--	--	--	--	15	--	35% vermiculite
			21-02B	flaky	0	10	0	--	--	--	--	--	60	--	30% vermiculite
21	03	Hall	21-03A	flaky	0	5	0	--	--	--	--	--	70	--	25% vermiculite
			21-03B	flaky	0	5	0	--	--	--	--	--	50	--	45% vermiculite
21	04	Library	21-04A	flakes	0	5	0	--	--	--	--	--	35	--	60% vermiculite
			21-04B	chunks	0	5	0	--	--	--	--	--	80	--	15% vermiculite
21	05	Classroom	21-05A	chunks, no flakes	0	5	0	--	--	--	--	--	60	--	35% vermiculite
			21-05B	chunky	0	20	0	--	--	--	--	--	40	--	40% vermiculite
21	near site 1		21-SV1	chunks	0	5	0	--	--	--	--	--	80	--	15% vermiculite
21	near site 2		21-SV2	flaky	0	5	0	--	--	--	--	--	50	--	45% vermiculite

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
21	01	1	1	1	2	3	2	3	1	2	7.5	24	--	0	1.1	--
			2	2	1	2	2	3	1	1		12			2.3	
			2	2	1	2	2	3	1	1		12			1.5	
21	02	1	1	1	2	3	2	3	1	2	12.5	24	--	0.01	1.5	--
			2	2	1	2	2	3	1	1		12			1.9	
			2	2	1	2	2	3	2	1		14			5.0	
21	03	1	1	1	2	3	2	3	1	2	5	24	--	0	1.1	--
			2	2	1	2	2	3	1	2		14			2.3	
			2	2	1	2	2	3	2	2		16			0.8	
21	04	1	1	1	2	3	2	3	1	1	5	20	--	0	3.1	--
			2	2	1	2	2	3	1	1		12			3.0	
			2	2	1	2	2	3	1	1		12			2.3	
21	05	1	1	1	2	3	2	3	1	2	12.5	24	--	0	0.8	--
			2	2	1	1	2	3	1	1		0			0.8	
			2	2	1	1	2	3	1	1		0			0.8	

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
22	01	Classroom	22-01A	flakes	0	0	0	--	--	--	--	--	--	--	vermiculite
			22-01B	chunky	0	0	0	--	--	--	--	--	--	5	95% vermiculite
22	02	Classroom	22-02A	chunky	0	0	0	--	--	--	--	--	15	5	80% vermiculite
			22-02B	chunky	0	0	0	--	--	--	--	--	--	--	vermiculite
22	03	Classroom	22-03A	chunky, no flakes	0	0	0	--	--	--	--	--	10	10	80% vermiculite
			22-03B	chunky	0	0	0	--	--	--	--	--	--	--	vermiculite
22	04	Classroom	22-04A	chunky	0	0	0	--	--	--	--	--	20	10	70% vermiculite
			22-04B	flakes	0	0	0	--	--	--	--	--	--	10	90% vermiculite
22	05	Classroom	22-05A	flaky	0	0	0	--	--	--	--	--	--	--	vermiculite
			22-05B	chunky, no flakes	0	0	0	--	--	--	--	--	--	--	vermiculite

No Bulk Sampling Variability data was collected in this building because asbestos-containing material was on beams and no 5000 ft^2 area could be defined.

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
22	01	1	1	1	1	3	1	1	1	2	0	0	--	--	3.1	--
			2	1	1	1	1	1	1	1		0			7.6	
			2	1	1	1	1	1	1	1		0			1.9	
22	02	1	1	1	1	3	1	1	1	2	0	0	--	--	8.0	
			2	1	1	1	1	1	1	1		0			0.4	
			2	1	1	1	1	1	1	1		0			1.5	
22	03	1	1	1	1	3	2	1	1	2	0	0	--	--	3.4*	
			2	1	1	1	1	1	1	1		0			5.7*	
			2	1	1	1	1	1	1	1		0			5.0*	
22	04	1	1	1	1	3	2	1	1	2	0	0	--	--	7.6*	
			2	1	1	1	1	1	1	1	0	0			4.8*	
			2	1	1	1	1	1	1	1		0			8.4*	
22	05	1	1	1	1	3	1	1	1	2	0	0	--	--	5.7	
			2	1	1	1	1	1	1	1		0			4.8	
			2	1	1	1	1	1	1	1		0			5.0	

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* Vibrator held horizontally.

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
23	01	Library	23-01A	chunky	0	trace	0	30	--	--	--	--	60	--	10% vermiculite
			23-01B	powder, no flakes	0	0	0	10	--	--	--	--	20	10	60% vermiculite
23	02	Restroom	23-02A	flaky	0	0	0	--	--	--	--	--	30	--	70% vermiculite
			23-02B	chunky	0	5	0	--	--	--	--	--	70	--	25% vermiculite
23	03	Administrative Office	23-03A	painted flakes	0	5	0	--	--	--	--	--	70	--	25% vermiculite
			23-03B	flaky	0	10	0	--	--	--	--	--	70	--	20% vermiculite
23 near site 1			23-SV1	chunky	0	0	0	20	--	--	--	--	--	--	10% mica 70% vermiculite
23 near site 1			23-SV2	chunks, flakes	0	0	0	--	--	--	--	--	--	10	90% vermiculite

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
23	01	1	1	1	2	2	1	3	1	1	0.	0	--	--	0.8	--
			2	1	1	2	1	3	1	1		0			0	
			2	1	1	2	1	3	1	3		0			0	
23	02	1	1	3	2	2	1	3	1	1	2.5	22	--	--	0.8	--
			2	2	2	3	1	3	2	1		36			0.8	
			2	2	1	2	1	3	1	3		18			0.8	
23	03	1	1	1	2	2	1	3	1	1	7.5	12	--	--	3.4	--
			2	1	1	2	1	3	1	3		14			0	
			2	1	1	2	1	3	1	2		12			2.7	

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
24	01	Home Economics Room	24-01A[(a)]	fibrous	0	60	0	10	--	--	--	--	30	--	--
			24-01B[(a)]	fibrous	0	60	0	20	--	--	--	--	20	--	--
			24-01C	powder with fibers	0	10	0	40	--	10	--	--	40	--	--
			24-01D	powder with fibers	0	20	0	50	--	10	--	--	20	--	--
24	02	Art Room	24-02A	powder with fibers	0	40	0	30	--	--	30	--	--	--	--
			24-02B	powder with fibers	0	20	0	40	--	--	--	--	40	--	--
		(tile on table top)	24-EXTRA	fibrous	0	70	0	15	--	--	--	--	15	--	--
24	03	Hall	24-03A	powder with fibers	0	30	0	40	--	10	--	--	20	--	--
			24-03B	powder with fibers	0	30	0	40	--	10	--	--	20	--	--

(a) Samples collected from water-damaged area.

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
24	01	1	1	3	2	2	2	3	3	2	15	26	--	--	0	--
			2	1	2	1	2	3	2	2		0			0	
			2	1	2	1	2	3	3	2		0			0	
			2	2	2	2	2	3	3	2		20				
			2	2	2	2	2	3	2	1		16				
			2	1	2	1	2	3	3	1		0				
			3	2	2	2	2	3	1	2		16				
			3	2	2	2	2	3	1	2		16				
			3	2	2	2	2	3	1	2		16				
			3	2	3	2	2	3	1	3		22				
			3	2	2	2	2	3	1	3		18				
			4	2	1	1	2	1	2	1		0				
			4	2	1	1	2	1	2	1		0				
			4	2	1	1	2	1	2	1		0				

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
24	01	2[a]	1	3	2	2	2	3	3	2	60	39	--	0	(b) --	--
			2	1	2	1	2	3	2	2		0				
			2	1	2	1	2	3	3	2		0				
			2	2	2	2	2	3	3	2		30				
			2	2	2	2	2	3	2	1		24				
			2	1	2	1	2	3	3	1		0				
			3	2	2	2	2	3	1	2		24				
			3	2	2	2	2	3	1	2		24				
			3	2	2	2	2	3	1	2		24				
			3	2	3	2	2	3	1	3		33				
			3	2	2	2	2	3	1	3		27				
			4	2	1	1	2	1	2	1		0				
			4	2	1	1	2	1	2	1		0				
			4	2	1	1	2	1	2	1		0				

(a) This site is a water-damaged area. Rating form data, bulk sampling data and vibrator data were collected at the water-damaged area.

(b) The extent of damage prevented vibrator air sampling.

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
24	02	1	1	2	2	2	2	3	2	3	30	20	--	--	0	--
			2	2	2	2	2	3	1	1		14			0	
			2	2	2	1	2	3	1	2		0			0.4	
			2	2	2	1	2	3	1	2		0				
			2	1	2	1	2	3	1	2		0				
			2	1	2	1	2	3	1	2		0				
			3	3	2	1	2	3	1	2		0				
			3	3	2	2	2	3	1	2		22				
			3	2	2	2	2	3	1	3		16				
			3	3	3	2	2	3	3	3		32				
			3	3	2	1	2	3	1	3		0				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
24	03	1	1	2	2	1	2	3	1	3	30	0	--	0	0	--
			2	1	2	1	2	3	1	3		0			0	
			2	1	2	1	2	3	1	2		0			0	
			2	1	2	1	2	3	1	3		0				
			2	2	2	2	2	3	1	3		18				
			2	1	2	1	2	3	1	3		0				
			3	3	2	1	2	3	3	1		0				
			3	3	2	2	2	3	3	2		26				
			3	3	2	2	2	3	3	2		26				
			3	3	2	2	2	3	3	2		26				
			3	3	2	1	2	3	3	2		0				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
25	01	Entrance Hall	25-01A	powder with fibers	0	10	0	50	--	5	--	--	35	--	--
			25-01B	powder with fibers	0	20	0	40	--	--	--	--	40	--	--
25	02	Classroom	25-02A	powder with fibers	0	20	0	20	--	--	30	--	30	--	--
			25-02B	powder with fibers	0	20	0	40	--	10	--	--	30	--	--
25	near site 1		25-SV1	powder with fibers	0	40	0	40	--	--	20	--	--	--	--
25	near site 2		25-SV2	powder with fibers	0	50	0	30	--	--	--	--	20	--	--

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
25	01	1	1	2	3	1	2	3	1	2	15	0	--	0	0	--
			2	1	2	1	2	3	1	2		0			0	
			2	1	2	1	1	3	1	3		0			0	
			2	2	2	2	2	3	1	1		14				
			2	1	2	1	2	3	1	3		0				
			2	1	2	1	2	3	1	3		0				
			3	2	2	2	2	3	1	2		16				
			3	2	3	2	2	3	1	2		20				
			3	2	3	1	2	3	1	3		0				
			3	3	3	2	2	3	1	3		28				
			3	2	2	2	2	3	1	3		18				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				
			4	1	1	1	2	1	1	1		0				

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
25	02	1	1	2	2	1	2	3	2	2	20	0	--	0	0	--
			2	1	2	1	2	3	1	2		0			0	
			2	1	2	1	2	3	1	2		0			0	
			2	1	2	1	2	3	1	2		0				
			2	1	2	2	2	3	1	1		10				
			2	1	2	1	2	3	1	2		0				
			3	2	2	3	2	3	1	2		32				
			3	2	2	2	2	3	2	2		18				
			3	2	2	2	2	3	2	2		18				
			3	2	2	2	2	3	3	3		22				
			3	2	2	2	2	3	2	2		18				
			4	2	1	1	2	1	2	1		0				
			4	2	1	1	2	1	2	1		0				
			4	2	1	1	2	1	2	1		0				
			4	2	1	1	2	1	2	1		0				

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
26	01	Air Plenum	26-01A	paper with fibers	0	40	0	--	--	--	--	--	--	60	--
			26-01B	paper with fibers	0	40	0	--	--	--	--	--	--	60	--

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
26	01	1	1	3	2	3	1	3	1	3	40	52	0.01	--	0.4*	--
			2	3	1	4	1	3	2	3		78			2.3*	
			2	3	1	4	1	3	1	1		60			1.5*	
			2	2	1	3	1	3	1	1		28				

---

* Vibrator held horizontally.

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
27	01	Air Plenum	27-01A	paper with fibers	0	50	0	--	--	--	--	--	--	50	--
			DET-2	cloth	0	60	0	--	--	--	10	--	--	30	--

SAMPLING SITE IDENTIFICATION			TYPE OF	UNWEIGHTED FACTOR SCORES							Average %	Exposure	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Score	PM	FAM	PM	FAM
27	01	1	1	3	2	3	1	3	1	3	55	78	0.03	--	2.7*	--
			2	3	1	3	1	3	1	3		72			3.4*	
			2	1	1	2	1	3	1	1		15			1.1*	

---

* Vibrator held horizontally.

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
28	02	Hall	28-02A	fibrous	0	30	0	--	--	--	10	50	10	--	--
			DET-1	fibrous	0	5	0	5	--	--	--	80	--	5	5% glass chips

SAMPLING SITE IDENTIFICATION			TYPE OF RATER	UNWEIGHTED FACTOR SCORES							Average % Asbestos	Exposure Score	Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION		Condition	Access	Friability	Air	Expose	Water	Activity			PM	FAM	PM	FAM
28	02	1	1	2	2	3	2	3	1	2	18	32	--	--	20.2	--
			2	2	2	4	1	3	1	2		54			0 *	
			2	1	2	3	1	3	1	3		32			14.5*	
			2	1	1	4	1	3	1	3		42				

---

* Too much dust on filter--no fibers visible.

Bldg	Site	Type of Room	Sample No.	Type of Material	Asbestos Content			Calcite	Cotton	Fibergls	Gypsum	Minrl-Wl	Opaque	Wood	Other
					Amosite	Chrysotile	Crocidolite								
29	01	Fan Room	29-01A	fibrous	80	0	0	--	--	--	--	--	10	--	10% glass chips
			DET-3	fibrous	80	0	0	--	--	--	10	--	--	--	10% glass chips

SAMPLING SITE IDENTIFICATION				UNWEIGHTED FACTOR SCORES									Air Sampling Data (Fibers/cc)			
													Normal		With Vibrator	
BLDG	SITE	SAMPLING LOCATION	TYPE OF RATER	Condition	Access	Friability	Air	Expose	Water	Activity	Average % Asbestos	Exposure Score	PM	FAM	PM	FAM
29	01	1	1	2	2	4	2	3	1	3	80	81	--	--	18.7	--
			2	1	2	3	1	3	1	1		36			38.0	
			2	2	1	4	1	3	1	3		81			60.2	

Note: The code used to identify the type of rater is:

1: Battelle rater using revised rating form
2: School administrator using revised rating form
3: Trained rater using revised rating form
4: School administrator using condensed original rating form
5: Battelle rater using condensed original rating form.

Letters are used to distinguish individual raters of a particular type.

TABLE B-2. TEM RESULTS FOR SELECTED NORMAL AIR SAMPLES

Sample Number	Number of Grid Openings Analyzed	Type of Asbestos	Fibers <5μ		Fibers >5μ		Total Asbestos Fibers ng/m^3
			Fibers Counted	Fibers per cc	Fibers Counted	Fibers per cc	
8-1	2	Chrysotile	71	2.1	0	<0.03	130
		Amphibole	15	0.44	7	0.20	4,600
8 Ambient	2	Chrysotile	87	2.5	0	<0.03	19
		Amphibole	0	<0.03	0	<0.03	--
9-3	2	Chrysotile	59	1.7	1	0.03	85
		Amphibole	26	0.76	0	<0.03	66
Blank	10	Chrysotile	7	--(a)	0	--(a)	--(a)
		Amphibole	0	--(a)	0	--(a)	--(a)
8-2	10	Chrysotile	87	0.51	0	<0.006	11
		Amphibole	3	0.02	0	<0.006	6
8-5	10	Chrysotile	41	0.24	0	<0.006	7.4
		Amphibole	1	0.01	0	<0.006	50
11-2	3	Chrysotile	88	1.7	0	<0.02	27
		Amphibole	0	<0.02	0	<0.02	--
Blank	10	Chrysotile	10	--(a)	0	--(a)	--(a)
		Amphibole	0	--(a)	0	--(a)	--(a)

(a) No air was filtered through the blanks; so fibers per cc and ng/m^3 cannot be calculated.

TABLE B-3. RESULTS OF LABORATORY ANALYSIS OF BULK SAMPLES COLLECTED AT EIGHT SAMPLING SITES

Sampling Site ID Number	Sampling Location	Laboratory Replicate	Total Percentage of Asbestos
1503	1	1	50
1503	1	2	50
1503	1	3	50
1503	1	4	60
1503	2	1	40
1503	2	2	50
1503	2	3	50
1503	2	4	40
1503	3	1	40
1503	3	2	50
1503	3	3	40
1503	3	4	60
1503	4	1	50
1503	4	2	50
1503	4	3	50
1503	4	4	40
1601	1	1	10
1601	1	2	10
1601	1	3	10
1601	1	4	5
1601	2	1	5
1601	2	2	20
1601	2	3	0
1601	2	4	10
1601	3	1	10
1601	3	2	5
1601	3	3	10
1601	3	4	20
1601	4	1	10
1601	4	2	20
1601	4	3	10
1601	4	4	30
1501	1	1	5
1801	1	2	20
1801	1	3	10
1801	1	4	5
1801	2	1	20
1801	2	2	10
1801	2	3	30
1801	2	4	10
1801	3	1	20
1801	3	2	10
1801	3	3	20
1801	3	4	10
1801	4	1	10
1801	4	2	20
1801	4	3	5
1801	4	4	5
1901	1	1	10
1901	1	2	5
1901	1	3	5
1901	1	4	15
1901	2	1	5
1901	2	2	5
1901	2	3	40
1901	2	4	10

TABLE B-3. (Continued)

Sampling Site ID Number	Sampling Location	Laboratory Replicate	Total Percentage of Asbestos
1901	3	1	20
1901	3	2	10
1901	3	3	20
1901	3	4	30
1901	4	1	30
1901	4	2	10
1901	4	3	0
1901	4	4	0
2101	1	1	5
2101	1	2	0
2101	1	3	0
2101	1	4	0
2101	2	1	10
2101	2	2	5
2101	2	3	0
2101	2	4	0
2101	3	1	5
2101	3	2	10
2101	3	3	0
2101	3	4	5
2101	4	1	5
2101	4	2	0
2101	4	3	0
2101	4	4	0
2301	1	1	0
2301	1	2	0
2301	1	3	1
2301	1	4	0
2301	2	1	0
2301	2	2	0
2301	2	3	0
2301	2	4	0
2301	3	1	0
2301	3	2	5
2301	3	3	0
2301	3	4	1
2301	4	1	0
2301	4	2	0
2301	4	3	0
2301	4	4	0
2401	1	1	40
2401	1	2	20
2401	1	3	10
2401	1	4	20
2401	2	1	20
2401	2	2	10
2401	2	3	10
2401	2	4	20
2401	3	1	30
2401	3	2	10
2401	3	3	10
2401	3	4	5
2401	4	1	30
2401	4	2	30
2401	4	3	10
2401	4	4	20

TABLE B-3. (Continued)

Sampling Site ID Number	Sampling Location	Laboratory Replicate	Total Percentage of Asbestos
2501	1	1	10
2501	1	2	20
2501	1	3	30
2501	1	4	15
2501	2	1	20
2501	2	2	10
2501	2	3	15
2501	2	4	30
2501	3	1	40
2501	3	2	20
2501	3	3	40
2501	3	4	10
2501	4	1	50
2501	4	2	10
2501	4	3	20
2501	4	4	10

TABLE B-4. ANALYSIS OF VARIANCE TABLES

Sampling Site 1503

```
                    SUM OF SQUARES    DEGREES OF FREEDOM    MEAN SQUARE
BETWEEN GROUPS          118.7500            (     3)           39.5833
WITHIN GROUPS           525.0000            (    12)           43.7500
   TOTAL                643.7500            (    15)
```

Sampling Site 1601

```
                    SUM OF SQUARES    DEGREES OF FREEDOM    MEAN SQUARE
BETWEEN GROUPS          204.6875            (     3)           68.2292
WITHIN GROUPS           631.2500            (    12)           52.6042
   TOTAL                835.9375            (    15)
```

TABLE B-4. (Continued)

Sampling Site 1801

	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
BETWEEN GROUPS	168.7500	(3)	56.2500
WITHIN GROUPS	675.0000	(12)	56.2500
TOTAL	843.7500	(15)	

Sampling Site 1901

	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
BETWEEN GROUPS	317.1875	(3)	105.7292
WITHIN GROUPS	1718.7500	(12)	143.2292
TOTAL	2035.9375	(15)	

TABLE B-4. (Continued)

Sampling Site 2101

```
                    SUM OF SQUARES     DEGREES OF FREEDOM     MEAN SQUARE
BETWEEN GROUPS          42.1875           (      3)             14.0625
WITHIN GROUPS          156.2500           (     12)             13.0208
   TOTAL               198.4375           (     15)
```

Sampling Site 2301

```
                    SUM OF SQUARES     DEGREES OF FREEDOM     MEAN SQUARE
BETWEEN GROUPS           6.1875           (      3)              2.0625
WITHIN GROUPS           17.7500           (     12)              1.4792
   TOTAL                23.9375           (     15)
```

TABLE B-4. (Continued)

Sampling Site 2401

```
                      SUM OF SQUARES    DEGREES OF FREEDOM    MEAN SQUARE
BETWEEN GROUPS           267.1875            (      3)           89.0625
WITHIN GROUPS           1218.7500            (     12)          101.5625
   TOTAL                1485.9375            (     15)
```

Sampling Site 2501

```
                      SUM OF SQUARES    DEGREES OF FREEDOM    MEAN SQUARE
BETWEEN GROUPS           206.2500            (      3)           68.7500
WITHIN GROUPS           2187.5000            (     12)          182.2917
   TOTAL                2393.7500            (     15)
```

TABLE B-5. D STATISTICS COMPUTED FOR UNTRAINED RATERS AND TRAINED RATERS, BOTH USING REVISED RATING FORM

Sampling Site	Rater	Factors						
		Cond.	Access.	Friab.	Air	Expose	Water Damage	Active
14-01-1	untrained	1.00	0.00	1.00	0.00	2.00	1.00	1.00
	trained	.36	0.00	.36	0.00	0.00	0.00	.36
14-02-1	untrained	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	trained	.36	0.00	.36	0.00	0.00	.36	0.00
14-03-1	untrained	0.00	0.00	0.00	0.00	2.00	1.00	2.00
	trained	.16	0.00	.36	0.00	0.00	.36	.16
15-01-1	untrained	1.00	0.00	0.00	1.00	0.00	1.00	0.00
	trained	0.00	.36	.16	0.00	0.00	0.00	.36
15-01-2	untrained	1.00	0.00	0.00	1.00	0.00	1.00	0.00
	trained	0.00	.36	.16	0.00	0.00	0.00	.36
15-03-1	untrained	0.00	0.00	1.00	1.00	0.00	1.00	0.00
	trained	0.00	.16	.16	0.00	0.00	0.00	.16
16-01-1	untrained	0.00	.16	.16	0.00	0.00	0.00	.36
	trained	.16	0.00	.36	0.00	0.00	.70	.16
16-02-1	untrained	.16	.36	.55	0.00	0.00	.36	.56
	trained	.16	.16	.16	0.00	0.00	0.00	0.00
16-02-2	untrained	.16	.36	.56	0.00	0.00	.36	.56
	trained	.16	.16	.16	0.00	0.00	0.00	0.00
16-03-1	untrained	0.00	.16	.16	0.00	0.00	0.00	.36
	trained	0.00	0.00	.16	0.00	0.00	0.00	.36
16-04-1	untrained	.16	0.00	.16	0.00	0.00	.36	.16
	trained	.16	0.00	0.00	0.00	0.00	.36	.36
17-01-1	untrained	0.00	.44	.25	0.00	.25	.44	0.00
	trained	0.00	0.00	.16	0.00	0.00	0.00	0.00
17-02-1	untrained	.25	.97	.25	0.00	.44	.44	.97
	trained	0.00	.16	.36	0.00	0.00	.36	.16
17-03-1	untrained	0.00	.25	.83	0.00	.50	0.00	.25
	trained	0.00	.36	.16	0.00	0.00	0.00	.16
19-01-1	untrained	0.00	.16	.36	0.00	0.00	0.00	.36
	trained	0.00	0.00	.16	0.00	0.00	0.00	0.00
19-02-1	untrained	.16	0.00	.70	0.00	.16	0.00	0.00
	trained	.16	0.00	0.00	0.00	0.00	0.00	.36
20-01-1	untrained	.16	0.00	.16	0.00	0.00	0.00	.16
	trained	0.00	0.00	.16	0.00	0.00	0.00	.16
20-02-1	untrained	.16	0.00	.16	0.00	0.00	.32	.16
	trained	0.00	0.00	0.00	0.00	0.00	0.00	.16
20-03-1	untrained	.16	0.00	.16	0.00	0.00	.16	.16
	trained	0.00	0.00	.16	0.00	0.00	0.00	.36
20-03-2	untrained	.16	0.00	.16	0.00	0.00	.16	.16
	trained	0.00	0.00	.16	0.00	0.00	0.00	.36
20-04-1	untrained	0.00	0.00	.16	0.00	0.00	.36	.36
	trained	.36	0.00	0.00	0.00	0.00	0.00	.16
24-01-1	untrained	.36	0.00	.36	0.00	0.00	.36	.36
	trained	0.00	.16	0.00	0.00	0.00	0.00	.36
24-01-2	untrained	.36	0.00	.36	0.00	0.00	.36	.36
	trained	0.00	.16	0.00	0.00	0.00	0.00	.36
24-02-1	untrained	.36	0.00	.16	0.00	0.00	0.00	.16
	trained	.16	.16	.36	0.00	0.00	.32	.36
24-03-1	untrained	.16	0.00	.16	0.00	0.00	0.00	.16
	trained	0.00	0.00	.36	0.00	0.00	0.00	.16
25-01-1	untrained	.16	0.00	.16	.16	0.00	0.00	.70
	trained	.16	.36	.16	0.00	0.00	0.00	.36
25-02-1	untrained	0.00	0.00	.16	0.00	0.00	0.00	.16
	trained	0.00	0.00	.16	0.00	0.00	.55	.16

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TABLE B-6. V STATISTICS COMPUTED FOR UNTRAINED RATERS AND TRAINED RATERS, BOTH USING REVISED RATING FORM

Sampling Site	Rater	Factors Cond.	Access	Friab.	Air	Expose	Water Damage	Active
14-01-1	untrained	.500	1.000	1.500	0.000	1.000	.500	.500
	trained	.600	1.000	.600	0.000	0.000	0.000	.400
14-02-1	untrained	.500	1.000	1.500	0.000	.500	0.000	.500
	trained	.600	1.000	.600	0.000	0.000	.400	1.000
14-03-1	untrained	0.000	0.000	1.000	0.000	1.000	.500	1.000
	trained	.800	0.000	.600	0.000	0.000	1.600	1.200
15-01-1	untrained	.500	1.000	0.000	.500	0.000	.500	1.000
	trained	0.000	.400	.800	0.000	0.000	1.000	.600
15-01-2	untrained	.500	1.000	0.000	.500	0.000	.500	1.000
	trained	0.000	.400	.800	0.000	0.000	1.000	.600
15-03-1	untrained	1.000	0.000	.500	.500	0.000	.500	1.000
	trained	0.000	.200	.800	0.000	0.000	0.000	.200
16-01-1	untrained	1.000	.200	.200	0.000	0.000	0.000	1.400
	trained	.200	1.600	.400	0.000	0.000	.600	.800
16-02-1	untrained	1.200	.400	.400	0.000	0.000	1.600	.400
	trained	.200	.800	.200	0.000	0.000	0.000	1.000
16-02-2	untrained	1.200	.400	.400	0.000	0.000	1.600	.400
	trained	.200	.800	.200	0.000	0.000	0.000	1.000
16-03-1	untrained	1.000	.200	.200	0.000	0.000	0.000	.600
	trained	0.000	1.000	.200	0.000	0.000	0.000	.600
16-04-1	untrained	.800	0.000	.200	0.000	0.000	1.600	1.200
	trained	.200	0.000	0.000	0.000	0.000	.600	.600
17-01-1	untrained	1.000	.500	.750	0.000	.250	.500	0.000
	trained	0.000	1.000	.200	0.000	0.000	0.000	0.000
17-02-1	untrained	.750	.750	.750	0.000	.500	.500	.750
	trained	1.000	.200	.400	0.000	0.000	.600	.200
17-03-1	untrained	1.000	1.750	1.000	0.000	1.500	0.000	.250
	trained	0.000	.400	.200	0.000	0.000	0.000	.800
19-01-1	untrained	.333	.167	.667	0.000	0.000	0.000	.333
	trained	1.000	0.000	.200	0.000	0.000	0.000	0.000
19-02-1	untrained	.167	0.000	.833	1.000	.167	0.000	1.000
	trained	.800	1.000	0.000	1.000	0.000	0.000	.600
20-01-1	untrained	1.200	0.000	.800	0.000	0.000	0.000	1.200
	trained	0.000	0.000	.200	0.000	0.000	0.000	.200
20-02-1	untrained	.800	0.000	.800	0.000	0.000	1.600	.800
	trained	1.000	0.000	0.000	0.000	0.000	0.000	.200
20-03-1	untrained	1.800	0.000	.800	0.000	0.000	.200	1.200
	trained	0.000	0.000	.200	0.000	0.000	0.000	.600
20-03-2	untrained	1.800	0.000	.800	0.000	0.000	.200	1.200
	trained	0.000	0.000	.200	0.000	0.000	0.000	.600
20-04-1	untrained	2.000	0.000	.800	0.000	0.000	.400	.600
	trained	.400	0.000	0.000	0.000	0.000	0.000	.200
24-01-1	untrained	1.600	0.000	.600	0.000	0.000	.400	.400
	trained	1.000	.200	0.000	0.000	0.000	2.000	.400
24-01-2	untrained	1.600	0.000	.600	0.000	0.000	.400	.400
	trained	1.000	.200	0.000	0.000	0.000	2.000	.400
24-02-1	untrained	.400	0.000	.800	0.000	0.000	1.000	1.200
	trained	.800	.200	.400	0.000	0.000	1.000	.400
24-03-1	untrained	.800	0.000	.200	0.000	0.000	0.000	.200
	trained	1.000	0.000	.600	0.000	0.000	2.000	1.200
25-01-1	untrained	.800	1.000	.200	.200	0.000	0.000	.800
	trained	.200	.400	.800	0.000	0.000	0.000	.600
25-02-1	untrained	1.000	0.000	.200	0.000	0.000	1.000	.200
	trained	0.000	0.000	1.200	0.000	0.000	.400	.200

TABLE B-7. D STATISTICS COMPUTED FOR UNTRAINED RATERS USING THE REVISED RATING FORM AND UNTRAINED RATERS USING THE ORIGINAL RATING FORM

Sampling Site	Rating Form	Factors						
		Cond.	Access.	Friab.	Air	Expose	Water Damage	Active
19-01-1	revised	0.00	0.00	.16	0.00	0.00	0.00	0.00
	original	.16	0.00	1.00	0.00	.16	0.00	.16
19-02-1	revised	.16	0.00	0.00	0.00	0.00	0.00	.36
	original	0.00	0.00	.16	0.00	.36	0.00	0.00
20-01-1	revised	0.00	0.00	.16	0.00	0.00	0.00	.16
	original	.32	0.00	1.28	0.00	.16	.16	.16
20-02-1	revised	0.00	0.00	0.00	0.00	0.00	0.00	.16
	original	.16	0.00	1.09	0.00	.16	0.00	.16
20-03-1	revised	0.00	0.00	.16	0.00	0.00	0.00	.36
	original	0.00	0.00	.16	0.00	.16	.16	0.00
20-03-2	revised	0.00	0.00	.16	0.00	0.00	0.00	.36
	original	0.00	0.00	.16	0.00	.16	.16	0.00
20-04-1	revised	.36	0.00	0.00	0.00	0.00	0.00	.16
	original	0.00	0.00	1.12	.16	.36	.16	.16
24-01-1	revised	0.00	.16	0.00	0.00	0.00	0.00	.36
	original	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-01-2	revised	0.00	.16	0.00	0.00	0.00	0.00	.36
	original	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-02-1	revised	.16	.16	.36	0.00	0.00	.32	.36
	original	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24-03-1	revised	0.00	0.00	.36	0.00	0.00	0.00	.16
	original	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-01-1	revised	.16	.36	.16	0.00	0.00	0.00	.36
	original	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25-02-1	revised	0.00	0.00	.16	0.00	0.00	.56	.16
	original	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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TABLE B-8. WEIGHTED FACTOR SCORES.

Sampling Site Identification			Type of Rater	Weighted Factor Scores							Wghted. % Asbestos	Exposure Score
Bldg.	Site	Sampling Location		Condition	Access	Friability	Air	Expose	Water	Activity		
6	1	1	5	5	1	2	0	4	2	1	2	52
6	1	1	4	2	1	1	0	4	2	2	2	22
6	1	1	4	5	1	2	0	4	2	2	2	56
6	1	1	4	2	1	2	0	4	2	1	2	40
6	1	1	4	2	1	2	0	4	1	1	2	36
6	1	1	4	2	1	3	0	4	2	1	2	60
6	2	1	5	2	1	1	0	4	2	2	2	22
6	2	1	4	2	1	1	0	4	1	2	2	20
6	2	1	4	5	3	3	0	4	2	2	2	96
6	2	1	4	5	3	3	1	4	2	2	2	102
6	2	1	4	5	3	1	1	4	2	2	2	34
5	2	1	4	2	1	2	1	4	1	1	2	40

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
7	1	1	5	2	1	1	0	4	1	2	2	20
7	1	1	4	2	0	1	1	4	1	1	2	18
7	1	1	4	2	0	1	1	4	1	1	2	18
7	1	1	4	2	3	1	1	4	1	2	2	26
7	1	1	4	0	1	0	1	4	0	2	2	0
7	1	1	4	2	0	1	0	4	1	0	2	14
7	2	1	5	2	1	0	0	4	1	1	2	0
7	2	1	4	2	3	2	0	4	1	1	2	44
7	2	1	4	2	3	2	1	4	1	2	2	52
7	2	1	4	2	3	2	1	4	1	2	2	52
7	2	1	4	2	3	2	1	4	1	2	2	52
7	2	1	4	2	0	2	0	4	1	1	2	32
7	3	1	5	2	1	1	0	4	1	1	2	18
7	3	1	4	2	1	1	0	4	1	1	2	18
7	3	1	4	2	3	3	1	4	1	0	2	66
7	3	1	4	2	1	1	1	4	1	0	2	18
7	3	1	4	2	0	1	0	0	1	0	2	6
7	3	1	4	0	1	1	1	4	1	0	2	14

Sampling Site Identification Bldg.	Site	Sampling Location	Type of Rater	Weighted Factor Scores Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
8	1	1	5	5	1	2	0	4	2	2	3	84
8	1	1	5	5	3	3	0	4	2	2	3	144
8	1	1	4	2	3	2	0	4	1	1	3	66
8	1	1	4	2	3	3	0	4	1	2	3	108
8	1	1	4	2	1	3	1	4	1	2	3	99
8	1	1	4	5	3	2	0	4	0	1	3	78
8	1	1	4	2	3	3	0	4	1	2	3	108
8	1	1	4	2	3	3	0	4	0	1	3	90
8	2	1	5	5	1	2	0	4	0	1	2	44
8	2	1	5	2	1	2	0	4	1	0	2	32
8	2	1	4	2	3	3	0	4	0	2	2	66
8	2	1	4	2	1	2	0	4	1	2	2	40
8	2	1	4	2	3	3	0	4	1	1	2	66
8	2	1	4	2	3	3	1	4	1	1	2	72
8	2	1	4	2	1	3	0	4	1	0	2	48
8	3	1	5	0	1	0	0	4	0	1	0	0
8	3	1	5	0	1	1	0	4	0	0	0	0
8	3	1	4	0	0	0	0	0	0	0	0	0
8	3	1	4	0	1	0	0	4	0	1	0	0
8	3	1	4	0	3	1	0	0	0	1	0	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
8	4	1	4	2	3	2	1	4	0	2	2	48
8	4	1	4	2	1	3	0	4	0	1	2	48
8	4	1	4	5	3	3	0	4	1	1	2	84
8	5	1	5	5	1	2	0	4	2	2	2	56
8	5	1	5	5	1	2	0	1	2	2	2	44
8	5	1	4	5	1	2	0	4	1	1	2	48
8	5	1	4	5	3	3	0	4	2	2	2	96
8	5	1	4	2	3	2	0	4	2	1	2	48
8	5	1	4	2	1	2	0	4	1	1	2	36
8	5	1	4	5	3	3	0	4	2	2	2	96
8	6	1	5	2	1	2	0	4	0	1	2	32
8	6	1	5	2	1	2	0	4	1	2	2	40
8	6	1	4	2	3	2	0	4	0	2	2	44
8	6	1	4	2	1	2	0	4	1	1	2	36
8	6	1	4	2	3	1	0	4	1	1	2	22
8	6	1	4	2	3	3	1	4	0	2	2	72
8	6	1	4	2	3	2	1	4	1	1	2	48
8	3	1	4	0	3	0	1	4	0	2	0	0
8	3	1	4	2	0	0	0	0	0	1	0	0
8	4	1	5	2	1	1	0	4	0	1	2	16
8	4	1	5	2	1	2	0	4	1	1	2	36
8	4	1	4	2	3	2	0	4	0	1	2	40
8	4	1	4	2	1	1	0	4	1	1	2	18

Sampling Site Identification												
				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
9	1	1	5	2	1	0	0	4	0	0	2	0
9	1	1	5	2	1	1	0	4	1	0	2	16
9	1	1	4	0	1	1	1	4	0	0	2	12
9	1	1	4	2	1	1	0	4	1	1	2	18
9	1	1	4	0	1	3	1	1	0	0	2	18
9	1	1	4	0	1	3	1	1	0	0	2	18
9	2	1	5	3	1	0	0	4	0	1	2	0
9	2	1	5	2	1	1	0	4	1	0	2	16
9	2	1	4	2	1	1	0	4	1	1	2	18
9	2	1	4	5	3	2	1	4	2	0	2	60
9	2	1	4	2	1	3	1	1	1	0	2	36
9	2	1	4	2	1	3	1	1	1	0	2	36
9	3	1	5	2	1	1	0	4	1	0	2	16
9	3	1	5	2	1	0	0	4	1	0	2	0
9	3	1	4	2	1	2	0	4	1	0	2	32
9	3	1	4	2	1	1	0	4	1	1	2	18
9	3	1	4	2	1	0	0	4	1	0	2	0
9	3	1	4	2	1	3	1	1	1	0	2	36
9	3	1	4	2	1	3	1	1	1	0	2	36

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
10	1	1	5	2	1	2	0	4	0	0	3	42
10	1	1	5	2	3	2	0	4	0	0	3	54
10	1	1	4	2	1	3	0	4	0	1	3	72
10	1	1	4	2	3	3	1	4	1	1	3	108
10	1	1	4	2	1	3	0	4	0	1	3	72
10	2	1	5	2	1	2	0	4	0	1	3	48
10	2	1	5	2	1	2	0	4	0	2	3	54
10	2	1	4	2	1	0	0	4	0	1	3	0
10	2	1	4	2	3	2	1	4	1	2	3	78
10	2	1	4	5	1	1	0	4	0	1	3	33

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
11	1	1	5	2	1	2	0	4	0	1	2	32
11	1	1	5	5	1	3	0	4	0	1	2	66
11	1	1	4	2	3	3	1	4	1	1	2	72
11	1	1	4	2	3	2	0	4	0	2	2	44
11	1	1	4	2	3	2	0	4	0	2	2	44
11	1	1	4	5	3	1	0	4	1	2	2	30
11	2	1	5	5	3	2	1	4	0	2	2	60
11	2	1	5	5	1	3	1	4	0	2	2	78
11	2	1	4	5	3	2	0	4	1	2	2	60
11	2	1	4	5	3	3	1	4	1	2	2	96
11	2	1	4	2	3	2	1	4	1	2	2	52
11	2	1	4	2	3	3	0	4	1	2	2	72

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
14	1	1	1	2	1	2	0	4	0	1	3	48
14	1	1	2	2	1	0	0	0	1	2	3	0
14	1	1	2	0	1	1	0	4	0	1	3	18
14	1	1	3	2	1	2	0	4	0	1	3	48
14	1	1	3	5	1	2	0	4	0	1	3	66
14	1	1	3	5	1	3	0	4	0	2	3	108
14	1	1	3	2	1	3	0	4	0	2	3	81
14	1	1	3	5	1	3	0	4	0	1	3	99
14	2	1	1	2	0	2	0	4	0	0	3	36
14	2	1	2	0	1	0	0	1	0	1	3	0
14	2	1	2	2	1	1	0	4	0	0	3	21
14	2	1	3	2	1	2	0	4	0	1	3	48
14	2	1	3	5	1	2	0	4	1	1	3	72
14	2	1	3	2	1	3	0	4	0	1	3	72
14	2	1	3	5	1	3	0	4	0	1	3	99
14	2	1	3	5	1	3	0	4	1	1	3	108
14	3	1	1	2	1	2	0	4	0	0	2	28
14	3	1	2	2	1	1	0	0	0	2	2	10
14	3	1	2	2	1	1	0	4	1	0	2	16
14	3	1	3	5	1	2	0	4	2	1	2	52

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
14	3	1	3	5	1	2	0	4	1	1	2	48
14	3	1	3	2	1	3	0	4	2	2	2	66
14	3	1	3	5	1	3	0	4	2	1	2	78
14	3	1	3	5	1	3	0	4	1	1	2	72

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
15	1	1	1	5	1	2	0	4	1	1	2	48
15	1	1	2	2	3	2	0	4	1	2	2	48
15	1	1	2	5	3	2	1	4	0	2	2	60
15	1	1	3	5	3	2	0	4	0	2	2	56
15	1	1	3	5	1	3	0	4	0	1	2	66
15	1	1	3	5	1	3	0	4	0	2	2	72
15	1	1	3	5	3	3	0	4	0	2	2	84
15	1	1	3	5	1	3	0	4	0	1	2	66
15	1	2	1	5	1	2	0	4	1	1	3	72
15	1	2	2	2	3	2	0	4	1	2	3	72
15	1	2	2	5	3	2	1	4	0	2	3	90
15	1	2	3	5	3	2	0	4	0	2	3	84
15	1	2	3	5	1	3	0	4	0	1	3	99
15	1	2	3	5	1	3	0	4	0	2	3	108
15	1	2	3	5	3	3	0	4	0	2	3	126
15	1	2	3	5	1	3	0	4	0	1	3	99
15	3	1	1	5	1	2	0	4	0	0	2	40
15	3	1	2	2	1	1	0	4	1	1	2	18
15	3	1	2	2	1	2	1	4	0	1	2	36
15	3	1	3	5	1	2	0	4	0	0	2	40

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
15	3	1	3	5	1	3	0	4	0	1	2	66
15	3	1	3	5	1	3	0	4	0	0	2	60
15	3	1	3	5	3	3	0	4	0	0	2	72
15	3	1	3	5	1	3	0	4	0	0	2	60

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
16	1	1	1	2	1	1	0	4	0	2	2	18
16	1	1	2	0	1	1	0	4	0	0	2	10
16	1	1	2	0	0	1	0	4	0	0	2	8
16	1	1	2	0	1	1	0	4	0	1	2	12
16	1	1	2	0	1	1	0	4	0	1	2	12
16	1	1	2	0	1	0	0	4	0	1	2	0
16	1	1	3	0	1	1	0	4	0	1	2	12
16	1	1	3	2	1	1	0	4	0	1	2	16
16	1	1	3	2	1	1	0	4	1	1	2	18
16	1	1	3	2	1	2	0	4	0	2	2	36
16	1	1	3	2	1	2	0	4	2	1	2	40
16	2	1	1	5	1	1	0	4	2	1	2	26
16	2	1	2	2	1	1	0	4	1	1	2	18
16	2	1	2	0	3	1	0	4	0	0	2	14
16	2	1	2	2	1	2	0	4	1	2	2	40
16	2	1	2	2	1	1	0	4	0	1	2	16
16	2	1	2	2	3	0	0	4	0	1	2	0
16	2	1	3	2	3	1	0	4	2	2	2	26
16	2	1	3	5	3	1	0	4	2	2	2	32
16	2	1	3	5	3	1	0	4	2	2	2	32

Sampling Site Identification			Type of Rater	Weighted Factor Scores							Wghted. % Asbestos	Exposure Score
Bldg.	Site	Sampling Location		Condition	Access	Friability	Air	Expose	Water	Activity		
16	2	1	3	5	3	2	0	4	2	2	2	64
16	2	1	3	5	1	1	0	4	2	2	2	28
16	2	2	1	5	1	1	0	4	2	1	2	26
16	2	2	2	2	1	1	0	4	1	1	2	18
16	2	2	2	0	3	1	0	4	0	0	2	14
16	2	2	2	2	1	2	0	4	1	2	2	40
16	2	2	2	2	1	1	0	4	0	1	2	16
16	2	2	2	2	3	0	0	4	0	1	2	0
16	2	2	3	2	3	1	0	4	2	2	2	26
16	2	2	3	5	3	1	0	4	2	2	2	32
16	2	2	3	5	3	1	0	4	2	2	2	32
16	2	2	3	5	3	2	0	4	2	2	2	64
16	2	2	3	5	1	1	0	4	2	2	2	28
16	3	1	1	2	1	1	0	4	0	1	2	16
16	3	1	2	0	1	1	0	4	0	1	2	12
16	3	1	2	0	1	1	0	4	0	0	2	10
16	3	1	2	0	0	1	0	4	0	0	2	8
16	3	1	2	0	1	1	0	4	0	1	2	12
16	3	1	2	0	1	0	0	4	0	0	2	0
16	3	1	3	2	1	2	0	4	0	1	2	32

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
16	3	1	3	2	1	1	0	4	0	1	2	16
16	3	1	3	2	1	1	0	4	0	0	2	14
16	3	1	3	2	1	1	0	4	0	0	2	14
16	3	1	3	2	1	1	0	4	0	0	2	14
16	4	1	1	2	1	1	0	4	2	2	2	22
16	4	1	2	3	1	1	0	4	1	1	2	14
16	4	1	2	0	1	1	0	4	0	1	2	12
16	4	1	2	0	1	1	0	4	0	1	2	12
16	4	1	2	0	1	1	0	4	0	0	2	10
16	4	1	2	2	1	0	0	4	1	1	2	0
16	4	1	3	5	1	1	0	4	1	1	2	24
16	4	1	3	2	1	1	0	4	1	1	2	18
16	4	1	3	2	1	1	0	4	1	2	2	20
16	4	1	3	2	1	1	0	4	2	2	2	22
16	4	1	3	2	1	1	0	4	2	1	2	20

17	1	1	1	5	1	2	0	4	2	1	0	0
17	1	1	2	2	0	1	0	4	2	1	0	0
17	1	1	2	2	1	2	0	4	1	1	0	0
17	1	1	2	2	0	1	0	1	1	1	0	0
17	1	1	2	2	1	1	0	4	2	1	0	0
17	1	1	3	5	1	3	0	4	2	1	0	0
17	1	1	3	5	1	2	0	4	2	1	0	0
17	1	1	3	5	1	2	0	4	2	1	0	0
17	1	1	3	5	1	2	0	4	2	1	0	0
17	1	1	3	5	1	2	0	4	2	1	0	0
17	2	1	1	5	1	2	0	4	1	1	0	0
17	2	1	2	2	0	1	0	1	2	0	0	0
17	2	1	2	2	1	2	0	4	1	2	0	0
17	2	1	2	2	0	1	0	1	1	0	0	0
17	2	1	2	5	3	1	0	4	2	1	0	0
17	2	1	3	5	3	3	0	4	2	1	0	0
17	2	1	3	5	1	2	0	4	1	1	0	0
17	2	1	3	5	1	2	0	4	2	1	0	0
17	2	1	3	5	1	3	0	4	2	2	0	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
17	2	1	3	5	1	2	0	4	1	1	0	0
17	3	1	1	5	3	2	0	4	0	1	0	0
17	3	1	2	2	1	2	0	4	0	1	0	0
17	3	1	2	2	0	1	0	0	0	1	0	0
17	3	1	2	2	0	0	0	0	0	1	0	0
17	3	1	2	2	0	1	0	0	0	0	0	0
17	3	1	3	5	3	3	0	4	0	2	0	0
17	3	1	3	5	3	2	0	4	0	2	0	0
17	3	1	3	5	1	2	0	4	0	2	0	0
17	3	1	3	5	3	2	0	4	0	2	0	0
17	3	1	3	5	1	2	0	4	0	1	0	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
18	1	1	1	5	3	1	0	4	0	2	2	28
18	2	1	1	2	1	1	0	4	2	1	2	20

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
19	1	1	1	0	3	1	0	4	0	2	2	18
19	1	1	2	2	1	1	0	4	0	1	2	16
19	1	1	2	2	3	1	0	4	0	1	2	20
19	1	1	2	2	3	0	0	4	0	2	2	8
19	1	1	2	2	3	0	0	4	0	2	2	0
19	1	1	2	2	3	0	0	4	0	2	2	0
19	1	1	3	2	3	0	0	4	0	2	2	0
19	1	1	3	2	3	1	0	4	0	2	2	22
19	1	1	3	2	3	1	0	4	0	2	2	22
19	1	1	3	2	3	1	0	4	0	2	2	22
19	1	1	3	2	3	1	0	4	0	2	2	22
19	1	1	4	2	3	1	0	1	0	2	2	16
19	1	1	4	2	3	1	0	4	0	2	2	22
19	1	1	4	2	3	1	0	4	0	2	2	22
19	1	1	4	2	3	1	0	4	0	2	2	22
19	1	1	4	0	3	1	0	4	0	1	2	16
19	1	1	2	0	3	0	0	4	0	2	2	0
19	2	1	1	2	3	1	1	4	0	2	2	24
19	2	1	2	2	3	2	0	4	0	1	2	40
19	2	1	2	0	3	0	0	4	0	1	2	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
19	2	1	2	2	3	0	0	4	0	1	2	0
19	2	1	2	2	3	0	0	4	0	1	2	0
19	2	1	2	2	3	1	0	1	0	1	2	14
19	2	1	3	5	3	1	0	4	0	2	2	28
19	2	1	3	5	3	1	0	4	0	2	2	28
19	2	1	3	2	3	1	0	4	0	1	2	20
19	2	1	3	5	3	1	0	4	0	1	2	26
19	2	1	3	5	3	1	0	4	0	1	2	26
19	2	1	4	2	3	1	0	1	0	0	2	12
19	2	1	4	2	3	2	0	4	0	0	2	36
19	2	1	4	2	3	1	0	4	0	0	2	18
19	2	1	4	2	3	1	0	4	0	0	2	18
19	2	1	4	2	3	1	0	1	0	0	2	12
19	2	1	2	2	3	0	0	4	0	1	2	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
20	1	1	1	5	1	1	1	4	2	2	0	0
20	1	1	2	0	1	0	1	4	2	1	0	0
20	1	1	2	2	1	0	1	4	2	1	0	0
20	1	1	2	2	1	0	1	4	2	0	0	0
20	1	1	2	2	1	0	1	4	2	1	0	0
20	1	1	2	2	1	1	1	4	2	1	0	0
20	1	1	3	5	1	2	1	4	2	2	0	0
20	1	1	3	5	1	1	1	4	2	2	0	0
20	1	1	3	5	1	1	1	4	2	2	0	0
20	1	1	3	5	1	1	1	4	2	1	0	0
20	1	1	3	5	1	1	1	4	2	2	0	0
20	1	1	4	2	1	0	0	1	1	0	0	0
20	1	1	4	2	1	3	0	1	1	0	0	0
20	1	1	4	2	1	3	0	1	1	0	0	0
20	1	1	4	5	1	3	0	1	2	1	0	0
20	1	1	4	2	1	0	0	4	1	0	0	0
20	2	1	1	2	1	1	1	4	2	1	2	22
20	2	1	2	0	1	0	1	4	0	0	2	0
20	2	1	2	0	1	0	1	4	0	0	2	0
20	2	1	2	0	1	0	1	4	0	1	2	0
20	2	1	2	0	1	0	1	4	0	0	2	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
20	2	1	2	2	1	1	1	4	2	0	2	20
20	2	1	3	5	1	1	1	4	2	1	2	28
20	2	1	3	5	1	1	1	4	2	1	2	28
20	2	1	3	5	1	1	1	4	2	1	2	28
20	2	1	3	5	1	1	1	4	2	2	2	30
20	2	1	3	5	1	1	1	4	2	1	2	28
20	2	1	4	2	1	0	0	1	1	0	2	0
20	2	1	4	2	1	3	0	1	1	0	2	30
20	2	1	4	2	1	0	0	1	1	1	2	0
20	2	1	4	0	1	0	0	4	1	0	2	0
20	2	1	4	2	1	3	0	1	1	0	2	30
20	3	1	1	5	1	1	1	4	2	2	2	30
20	3	1	2	0	1	0	1	4	2	1	2	0
20	3	1	2	3	1	0	1	4	2	1	2	0
20	3	1	2	0	1	0	1	4	1	1	2	0
20	3	1	2	3	1	0	1	4	2	0	2	0
20	3	1	2	2	1	1	1	4	2	1	2	22
20	3	1	3	5	1	2	1	4	2	1	2	56
20	3	1	3	5	1	1	1	4	2	2	2	30
20	3	1	3	5	1	1	1	4	2	1	2	28
20	3	1	3	5	1	1	1	4	2	2	2	30

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
20	3	1	3	5	1	1	1	4	2	1	2	20
20	3	1	4	2	1	0	0	1	1	0	2	0
20	3	1	4	2	1	1	0	1	1	0	2	10
20	3	1	4	2	1	1	0	1	1	0	2	10
20	3	1	4	2	1	1	0	1	2	0	2	12
20	3	1	4	2	1	1	0	4	1	0	2	16
20	3	2	1	5	1	1	1	4	2	2	0	0
20	3	2	2	0	1	0	1	4	2	1	0	0
20	3	2	2	0	1	0	1	4	2	1	0	0
20	3	2	2	0	1	0	1	4	1	1	0	0
20	3	2	2	0	1	0	1	4	2	0	0	0
20	3	2	2	2	1	1	1	4	2	1	0	0
20	3	2	3	5	1	2	1	4	2	1	0	0
20	3	2	3	5	1	1	1	4	2	2	0	0
20	3	2	3	5	1	1	1	4	2	1	0	0
20	3	2	3	5	1	1	1	4	2	2	0	0
20	3	2	3	5	1	1	1	4	2	1	0	0
20	3	2	4	2	1	0	0	1	1	0	0	0
20	3	2	4	2	1	1	0	1	1	0	0	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
20	3	2	4	2	1	1	0	1	1	0	0	0
20	3	2	4	2	1	1	0	1	2	0	0	0
20	3	2	4	2	1	1	0	4	1	0	0	0
20	4	1	1	5	1	1	1	4	2	1	0	0
20	4	1	2	0	1	0	1	4	2	0	0	0
20	4	1	2	0	1	0	1	4	2	1	0	0
20	4	1	2	0	1	0	1	4	1	1	0	0
20	4	1	2	0	1	0	1	4	1	0	0	0
20	4	1	2	0	1	1	1	4	2	0	0	0
20	4	1	3	5	1	1	1	4	2	1	0	0
20	4	1	3	5	1	1	1	4	2	1	0	0
20	4	1	3	5	1	1	1	4	2	1	0	0
20	4	1	3	2	1	1	1	4	2	2	0	0
20	4	1	3	2	1	1	1	4	2	1	0	0
20	4	1	4	2	1	0	0	1	1	0	0	0
20	4	1	4	2	1	3	0	1	1	0	0	0
20	4	1	4	2	1	3	0	1	1	0	0	0
20	4	1	4	2	1	3	1	4	2	1	0	0
20	4	1	4	2	1	1	0	4	1	0	0	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
21	1	1	1	0	1	2	0	4	0	1	2	24
21	1	1	2	2	0	1	0	4	0	0	2	12
21	1	1	2	2	0	1	0	4	0	0	2	12
21	2	1	1	3	1	2	0	4	0	1	2	24
21	2	1	2	2	0	1	0	4	0	0	2	12
21	2	1	2	2	0	1	0	4	1	0	2	14
21	3	1	1	0	1	2	0	4	0	1	2	24
21	3	1	2	2	0	1	0	4	0	1	2	14
21	3	1	2	2	0	1	0	4	1	1	2	16
21	4	1	1	3	1	2	0	4	0	0	2	20
21	4	1	2	2	0	1	0	4	0	0	2	12
21	4	1	2	2	0	1	0	4	0	0	2	12
21	5	1	1	0	1	2	0	4	0	1	2	24
21	5	1	2	2	0	0	0	4	0	0	2	0
21	5	1	2	2	0	0	0	4	0	0	2	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
22	1	1	1	0	0	2	1	0	0	1	0	0
22	1	1	2	0	0	0	1	0	0	0	0	0
22	1	1	2	0	0	0	1	0	0	0	0	0
22	2	1	1	0	0	2	1	0	0	1	0	0
22	2	1	2	0	0	0	1	0	0	0	0	0
22	2	1	2	0	0	0	1	0	0	0	0	0
22	3	1	1	0	0	2	0	0	0	1	0	0
22	3	1	2	0	0	0	1	0	0	0	0	0
22	3	1	2	0	0	0	1	0	0	0	0	0
22	4	1	1	0	0	2	0	0	0	1	0	0
22	4	1	2	0	0	0	1	0	0	0	0	0
22	4	1	2	0	0	0	1	0	0	0	0	0
22	5	1	1	0	0	2	1	0	0	1	0	0
22	5	1	2	0	0	0	1	0	0	0	0	0
22	5	1	2	0	0	0	1	0	0	0	0	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
23	1	1	1	0	1	1	1	4	0	0	0	0
23	1	1	2	0	0	1	1	4	0	0	0	0
23	1	1	2	0	0	1	1	4	0	2	0	0
23	2	1	1	5	1	1	1	4	0	0	2	22
23	2	1	2	2	1	2	1	4	1	0	2	36
23	2	1	2	2	0	1	1	4	0	2	2	18
23	3	1	1	0	1	1	1	4	0	0	2	12
23	3	1	2	0	0	1	1	4	0	2	2	14
23	3	1	2	0	0	1	1	4	0	1	2	12

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
24	1	1	1	5	1	1	0	4	2	1	2	26
24	1	1	2	0	1	0	0	4	1	1	2	0
24	1	1	2	0	1	0	0	4	2	1	2	0
24	1	1	2	2	1	1	0	4	2	1	2	20
24	1	1	2	2	1	1	0	4	1	0	2	16
24	1	1	2	0	1	0	0	4	2	0	2	0
24	1	1	3	2	1	1	0	4	0	1	2	16
24	1	1	3	2	1	1	0	4	0	1	2	16
24	1	1	3	2	1	1	0	4	0	1	2	16
24	1	1	3	2	3	1	0	4	0	2	2	22
24	1	1	3	2	1	1	0	4	0	2	2	18
24	1	1	4	2	0	0	0	0	1	0	2	0
24	1	1	4	2	0	0	0	0	1	0	2	0
24	1	1	4	2	0	0	0	0	1	0	2	0
24	1	2	1	5	1	1	0	4	2	1	3	39
24	1	2	2	0	1	0	0	4	1	1	3	0
24	1	2	2	0	1	0	0	4	2	1	3	0
24	1	2	2	2	1	1	0	4	2	1	3	30
24	1	2	2	2	1	1	0	4	1	0	3	24
24	1	2	2	0	1	0	0	4	2	0	3	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
24	1	2	3	2	1	1	0	4	0	1	3	24
24	1	2	3	2	1	1	0	4	0	1	3	24
24	1	2	3	2	1	1	0	4	0	1	3	24
24	1	2	3	2	3	1	0	4	0	2	3	33
24	1	2	3	2	1	1	0	4	0	2	3	27
24	1	2	4	2	0	0	0	0	1	0	3	0
24	1	2	4	2	0	0	0	0	1	0	3	0
24	1	2	4	2	0	0	0	0	1	0	3	0
24	2	1	1	2	1	1	0	4	1	2	2	20
24	2	1	2	2	1	1	0	4	0	0	2	14
24	2	1	2	2	1	0	0	4	0	1	2	0
24	2	1	2	2	1	0	0	4	0	1	2	0
24	2	1	2	0	1	0	0	4	0	1	2	0
24	2	1	2	0	1	0	0	4	0	1	2	0
24	2	1	3	5	1	0	0	4	0	1	2	0
24	2	1	3	5	1	1	0	4	0	1	2	22
24	2	1	3	2	1	1	0	4	0	2	2	18
24	2	1	3	5	3	1	0	4	2	2	2	32
24	2	1	3	5	1	0	0	4	0	2	2	0
24	2	1	4	0	0	0	0	0	0	0	2	0

Sampling Site Identification

Bldg.	Site	Sampling Location	Type of Rater	Weighted Factor Scores: Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
24	2	1	4	0	0	0	0	0	0	0	2	0
24	2	1	4	0	0	0	0	0	0	0	2	0
24	2	1	4	0	0	0	0	0	0	0	2	0
24	3	1	1	2	1	0	0	4	0	2	2	0
24	3	1	2	0	1	0	0	4	0	2	2	0
24	3	1	2	0	1	0	0	4	0	1	2	0
24	3	1	2	0	1	0	0	4	0	2	2	0
24	3	1	2	2	1	1	0	4	0	2	2	18
24	3	1	2	0	1	0	0	4	0	2	2	0
24	3	1	3	5	1	0	0	4	2	0	2	0
24	3	1	3	5	1	1	0	4	2	1	2	26
24	3	1	3	5	1	1	0	4	2	1	2	26
24	3	1	5	5	1	1	0	4	2	1	2	26
24	3	1	3	5	1	0	0	4	2	1	2	0
24	3	1	4	0	0	0	0	0	0	0	2	0
24	3	1	4	0	0	0	0	0	0	0	2	0
24	3	1	4	0	0	0	0	0	0	0	2	0
24	3	1	4	0	0	0	0	0	0	0	2	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
25	1	1	1	2	3	0	0	4	0	1	2	0
25	1	1	2	0	1	0	0	4	0	1	2	0
25	1	1	2	0	1	0	1	4	0	2	2	0
25	1	1	2	2	1	1	0	4	0	0	2	14
25	1	1	2	0	1	0	0	4	0	2	2	0
25	1	1	2	0	1	0	0	4	0	2	2	0
25	1	1	3	2	1	1	0	4	0	1	2	16
25	1	1	3	2	3	1	0	4	0	1	2	20
25	1	1	3	2	3	0	0	4	0	2	2	0
25	1	1	3	5	3	1	0	4	0	2	2	28
25	1	1	3	2	1	1	0	4	0	2	2	18
25	1	1	4	0	0	0	0	0	0	0	2	0
25	1	1	4	0	0	0	0	0	0	0	2	0
25	1	1	4	0	0	0	0	0	0	0	2	0
25	1	1	4	0	0	0	0	0	0	0	2	0
25	2	1	1	2	1	0	0	4	1	1	2	0
25	2	1	2	0	1	0	0	4	0	1	2	0
25	2	1	2	0	1	0	0	4	0	1	2	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
25	2	1	2	0	1	0	0	4	0	1	2	0
25	2	1	2	0	1	1	0	4	0	0	2	10
25	2	1	2	0	1	0	0	4	0	1	2	0
25	2	1	3	2	1	2	0	4	0	1	2	32
25	2	1	3	2	1	1	0	4	1	1	2	10
25	2	1	3	2	1	1	0	4	1	1	2	10
25	2	1	3	2	1	1	0	4	2	2	2	22
25	2	1	3	2	1	1	0	4	1	1	2	10
25	2	1	4	2	0	0	0	0	1	0	2	0
25	2	1	4	2	0	0	0	0	1	0	2	0
25	2	1	4	2	0	0	0	0	1	0	2	0
25	2	1	4	2	0	0	0	0	1	0	2	0

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
26	1	1	1	5	1	2	1	4	0	2	2	52
26	1	1	2	5	0	3	1	4	1	2	2	78
26	1	1	2	5	0	3	1	4	0	0	2	60
26	1	1	2	2	0	2	1	4	0	0	2	28

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
27	1	1	1	5	1	2	1	4	0	2	3	78
27	1	1	2	5	0	2	1	4	0	2	3	72
27	1	1	2	0	0	1	1	4	0	0	3	15

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
28	2	1	1	2	1	2	0	4	0	1	2	32
28	2	1	2	2	1	3	1	4	0	1	2	54
28	2	1	2	0	1	2	1	4	0	2	2	32
28	2	1	2	0	0	3	1	4	0	2	2	42

Sampling Site Identification				Weighted Factor Scores								
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score
29	1	1	1	2	1	3	0	4	0	2	3	81
29	1	1	2	0	1	2	1	4	0	0	3	36
29	1	1	2	2	0	3	1	4	0	2	3	81

BUILDING INFORMATION

Corrective Actions Taken or Planned

BUILDING INFORMATION

Corrective Actions Taken or Planned

Building Number 6

Corrective action information was not obtained for this building.

Building Number 7

Corrective action information was not obtained for this building.

Building Number 8

The asbestos containing ceilings in this building were removed in the spring of 1979. At several sites in the building, particularly sites 08-01 and 08-05, the material was deteriorating. Because of the poor condition at these sites and because the school district had funds available, all the asbestos-containing ceilings in the building were removed.

Building Number 9

Corrective action information was not obtained for this building.

Building Number 10

A small portion of the asbestos containing ceilings have been removed, and contracts have been signed to have the rest of the asbestos containing ceiling removed in the summer of 1980. Public pressure and fear of future health problems promoted this course of action. The material was removed rather than encapsulated for two reasons: the cost for removal was not much greater than for encapsulation (excluding cost of new ceiling tile); the officials doubted the permanency of encapsulation.

Building Number 11

The asbestos containing ceilings in what are considered the most critical areas have been removed, and the rest will be removed by the end of summer, 1980. Public pressure greatly influenced the decision to remove the offending ceilings. The material was removed rather than encapsulated for two reasons: the cost for removal was not significantly greater than for encapsulation, since the authorities planned to add a layer of ceiling tile in either case; the board felt that encapsulation has not been shown to be a sufficient long-term solution.

Building Number 12

Corrective action information was not obtained for this building.

Building Number 13

Corrective action information was not obtained for this building.

Building Number 14

No corrective action has been taken as of spring 1980, since the asbestos containing material was not in a friable condition and did not present as much of a potential health problem as other ceilings in other buildings. However, as funds become available, the board plans eventually to remove and replace the ceilings in this building.

Building Number 15

The majority of the school building has been closed. Four classrooms are still in use, and the asbestos containing ceilings in these rooms have been removed and replaced with a sealant and a one inch covering of a cellulose material as of spring 1980. The board had planned to close this school over summer 1980 and remove all offending ceiling material at that time to avoid future health problems, but massive public pressure

Building Number 15 (Continued)

forced this building to be closed and double sessions to be instituted at another facility. Bids have been let to remove and replace the rest of the asbestos-containing ceilings over the summer of 1980, and the building will be completely re-opened in fall 1980.

Building Number 16

Corrective action information was not obtained for this building.

Building Number 17

Corrective action information was not obtained for this building.

Building Number 18

The ceilings have been encapsulated as of spring 1980. The deteriorated areas or areas where air sampling showed asbestos to be present are scheduled to be removed and replaced in the summer of 1980. All other ceilings will be monitored, and removed and replaced if deterioration becomes significant. Knowledge of the asbestos content and potential health hazards prompted the action and future plans.

Building Number 19

All the asbestos-containing ceilings were removed and replaced because their condition was deteriorating and air sampling test results showed definite fiber content. Test results and awareness of health hazards prompted this action.

Building Number 20

The damaged asbestos-containing material has been removed and replaced. Due to the low or zero asbestos fiber levels measured by the air sampling device, no further action is planned, except re-evaluation and retesting. Awareness of the asbestos content and potential health hazards prompted this course of action. The authorities reported very little public pressure.

Building Number 21

Corrective action information was not obtained for this building.

Building Number 22

Corrective action information was not obtained for this building.

Building Number 23

Corrective action information was not obtained for this building.

Building Number 24

No action has been taken as of spring 1980; the ceilings containing asbestos are scheduled to be encapsulated sometime in the summer of 1980 and will be monitored thereafter. EPA findings and the Battelle study have prompted the action and plans; there has been no significant public pressure, since the authorities acted to ameliorate the problem and inform the public.

Building Number 25

No action has been taken on this building as of spring 1979. The authorities are using air sampling results as partial justification for delaying action. Encapsulation is scheduled to take place in the summer of 1980, and the ceiling conditions and air quality will be monitored to detect any deterioration which may occur in the future.

Building Number 26

No corrective action has been taken. A state agency tested air samples with methods similar to Battelle's (excluding the vibration testing), and the results indicated that there were no air samples which contained fiber levels above the current standards. The board is considering action and favors encapsulation. Methods, standards and costs are being evaluated by the board.

Building Number 27

No corrective action has been taken. A state agency tested air samples with methods similar to Battelle's (excluding the vibration testing), and the results indicated that there were no air samples which contained fiber levels above the current standards. The board is considering action and favors encapsulation. Methods, standards and costs are being evaluated by the board.

Building Number 28

No corrective action has been taken. A state agency tested air samples with methods similar to Battelle's (excluding the vibration testing), and the results indicated that there were no air samples which contained fiber levels above the current standards. The board is considering action and favors encapsulation. Methods, standards and costs are being evaluated by the board.

Building Number 29

No corrective action has been taken. A state agency tested air samples with methods similar to Battelle's (excluding the vibration testing), and the results indicated that there were no air samples which contained fiber levels above the current standards. The board is considering action and favors encapsulation. Methods, standards and costs are being evaluated by the board.

BUILDING INFORMATION

Diagrams of Typical Sites Showing Bulk-Sampling and Vibrator Locations

FIGURE B-1. SAMPLING LOCATIONS AT
SITE 15-03(CLASSROOM)

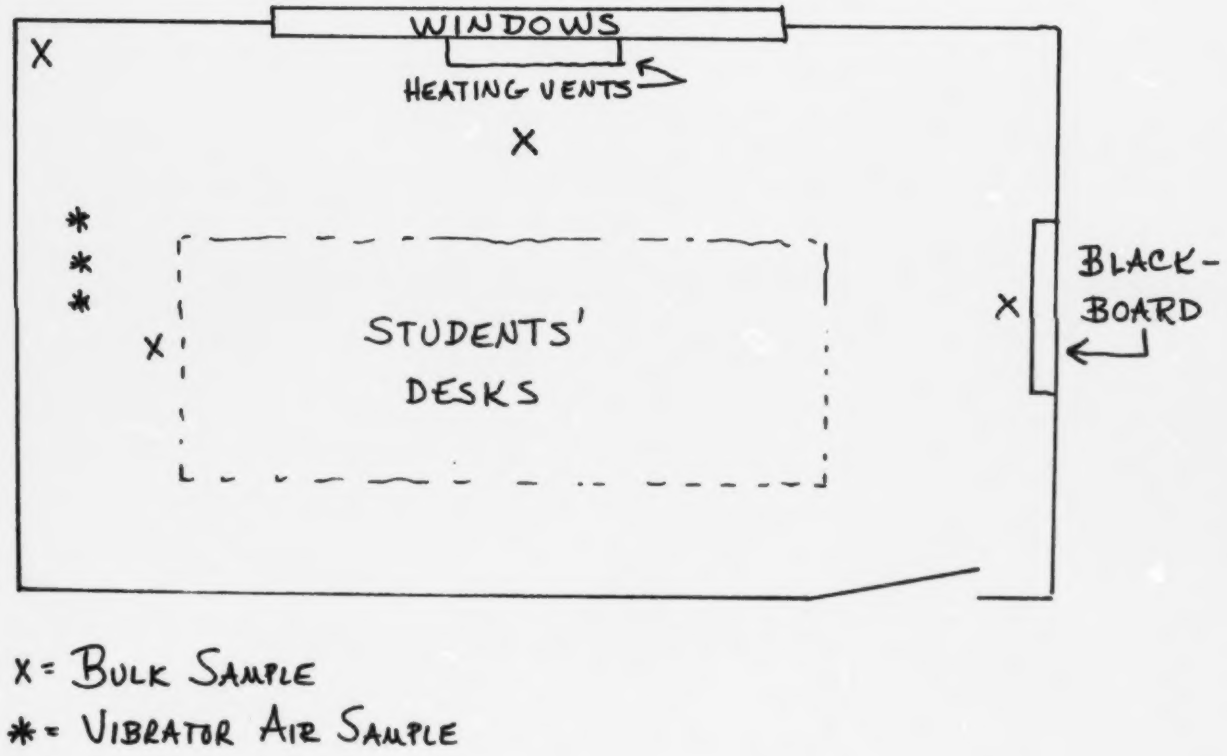

WINDOWS
HEATING VENTS
X
X
X
X
X
* * *
STUDENTS' DESKS
BLACK-BOARD
X = BULK SAMPLE
* = VIBRATOR AIR SAMPLE

FIGURE B-2. SAMPLING LOCATIONS AT SITE 16-01 (ENTRANCE HALL)

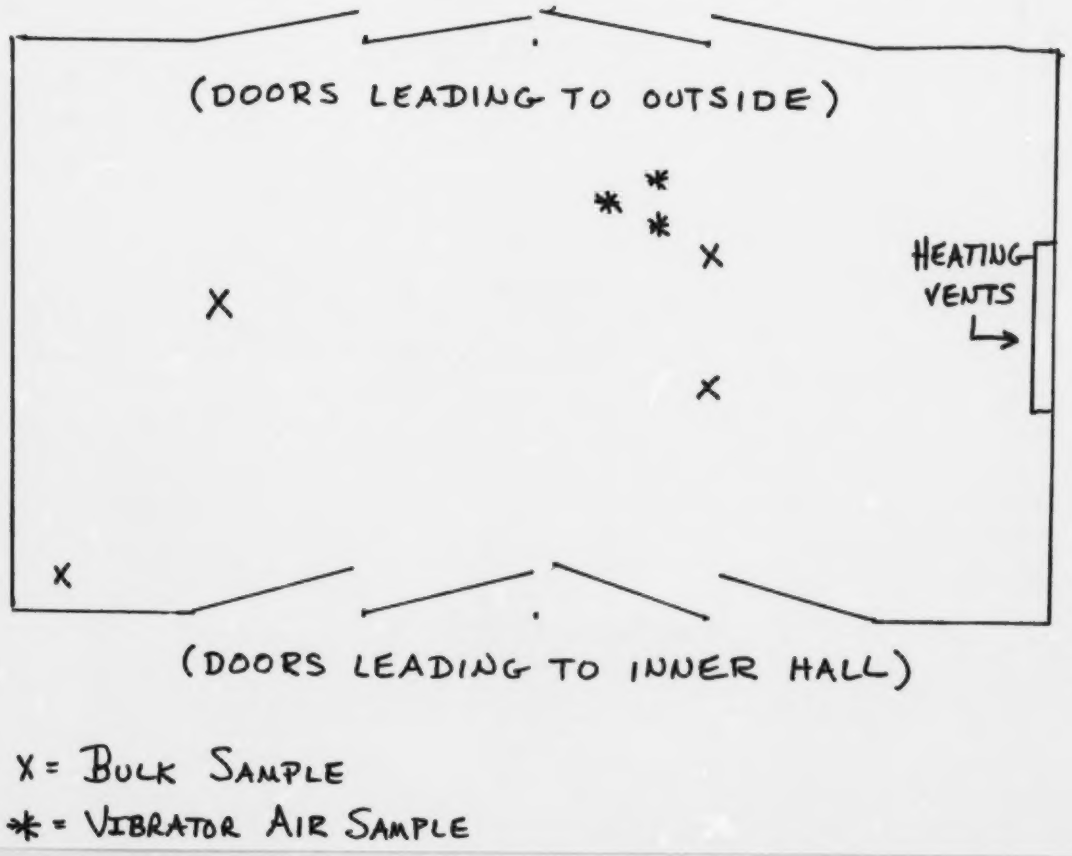

(DOORS LEADING TO OUTSIDE)
HEATING VENTS
(DOORS LEADING TO INNER HALL)
X = BULK SAMPLE
✱ = VIBRATOR AIR SAMPLE

FIGURE B-3. SAMPLING LOCATIONS AT
SITE 18-01 (ENTRANCE HALL)

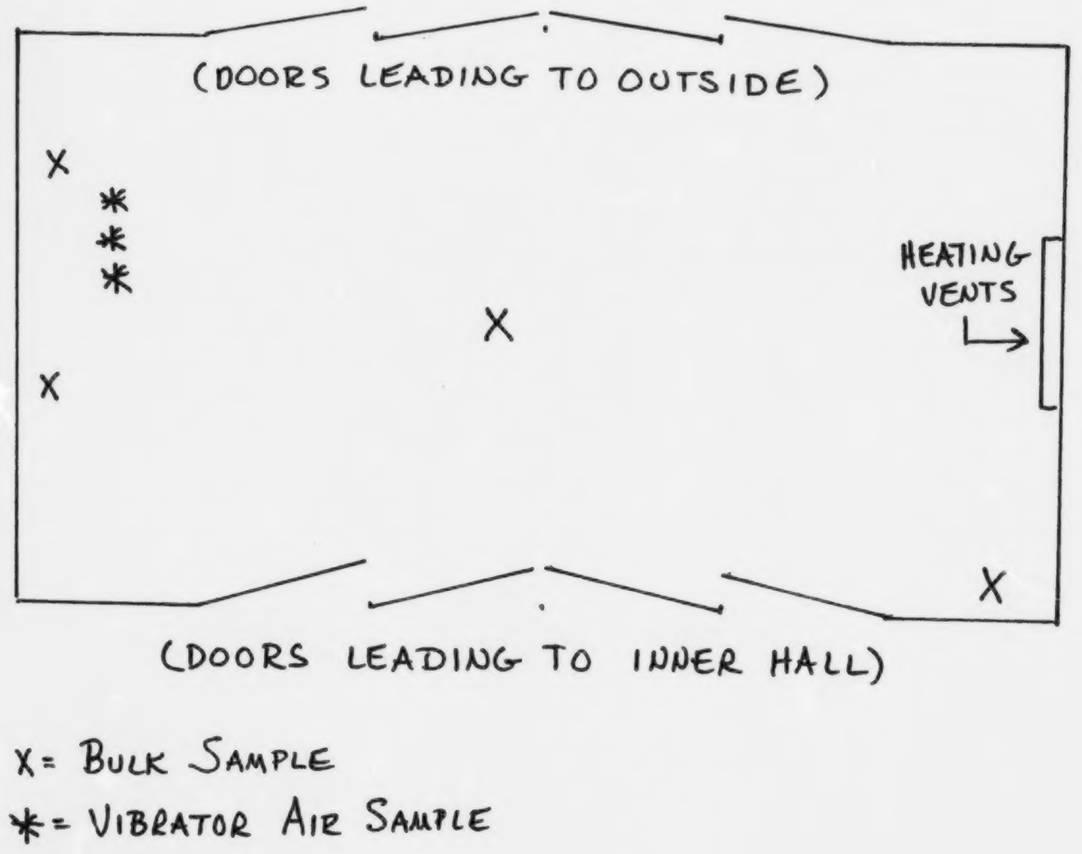

(DOORS LEADING TO OUTSIDE)
HEATING VENTS
(DOORS LEADING TO INNER HALL)
X = BULK SAMPLE
* = VIBRATOR AIR SAMPLE

FIGURE B-4. SAMPLING LOCATIONS AT SITE 19-01 (HALLWAY AND MUSIC PRACTICE ROOM)

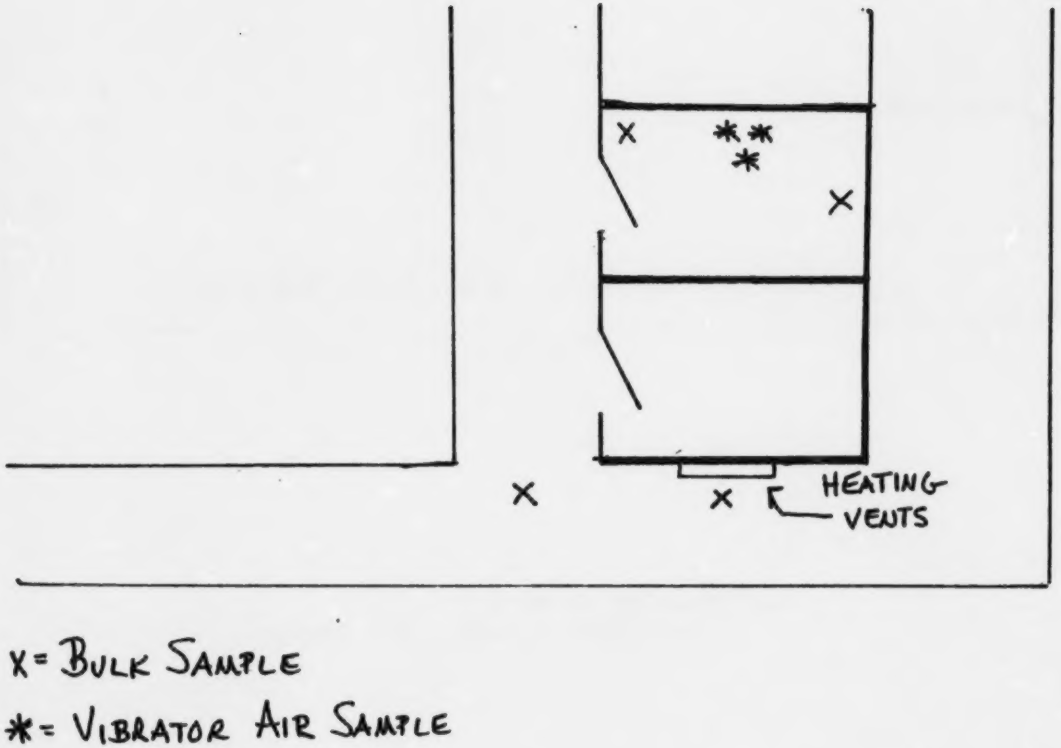

HEATING VENTS
X = BULK SAMPLE
✱ = VIBRATOR AIR SAMPLE

FIGURE B-5. SAMPLING LOCATIONS AT SITE 21-01 (BOILER ROOM)

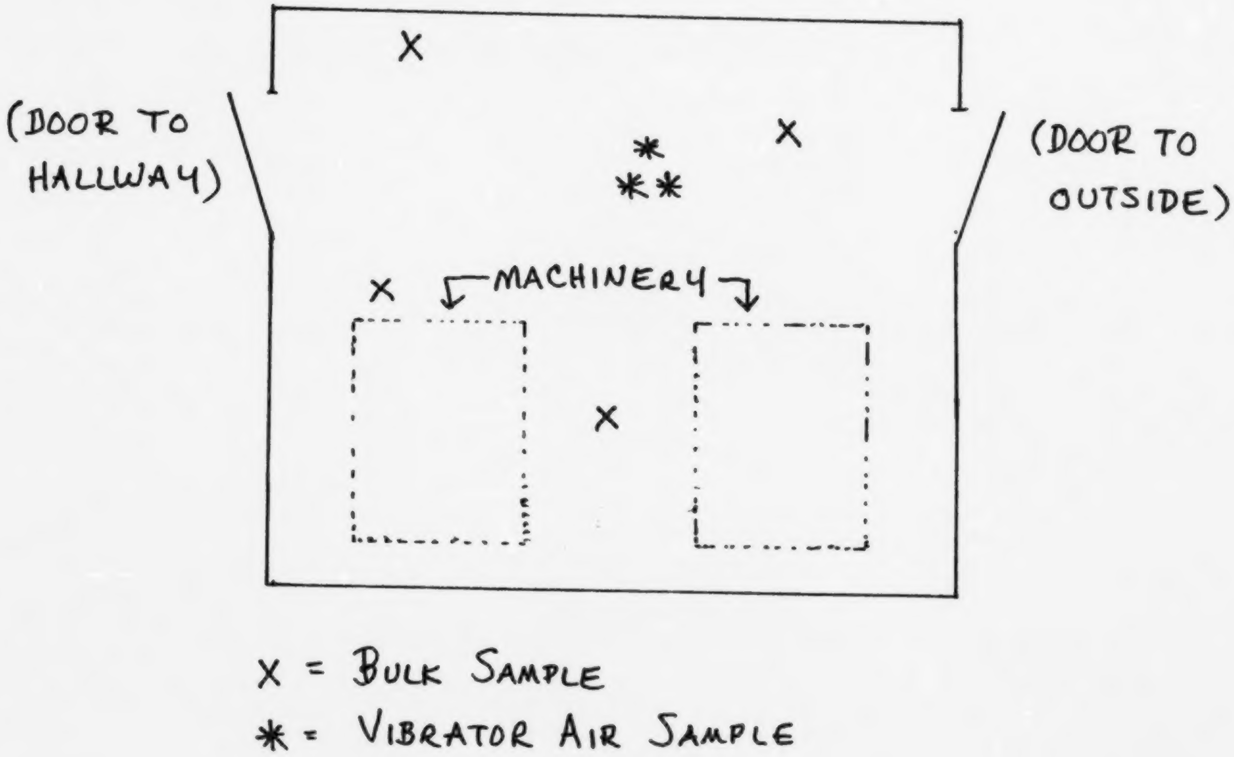

(DOOR TO HALLWAY)
(DOOR TO OUTSIDE)
MACHINERY
X = BULK SAMPLE
✱ = VIBRATOR AIR SAMPLE

FIGURE B-6. SAMPLING LOCATIONS AT
SITE 23-01 (LIBRARY)

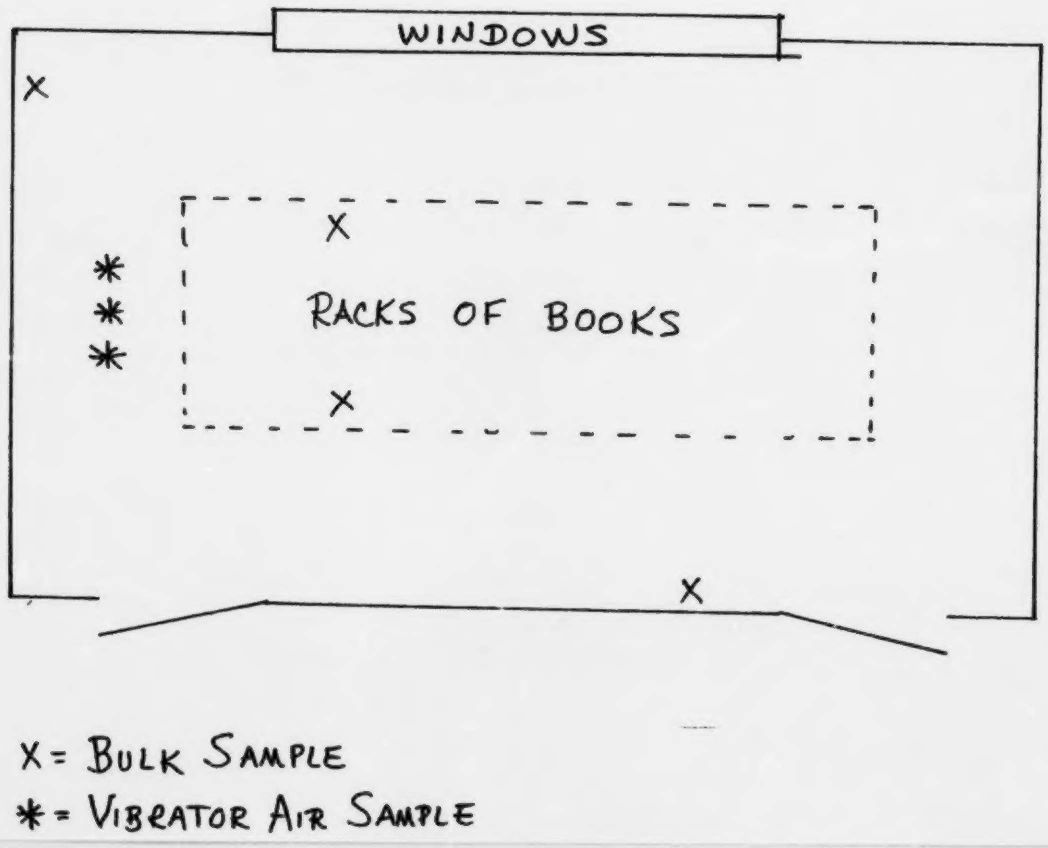

WINDOWS
X
X
RACKS OF BOOKS
X
X
X = BULK SAMPLE
* = VIBRATOR AIR SAMPLE

FIGURE B-7. SAMPLING LOCATIONS AT SITE 24-01 (CLASSROOM AND HALLWAY)

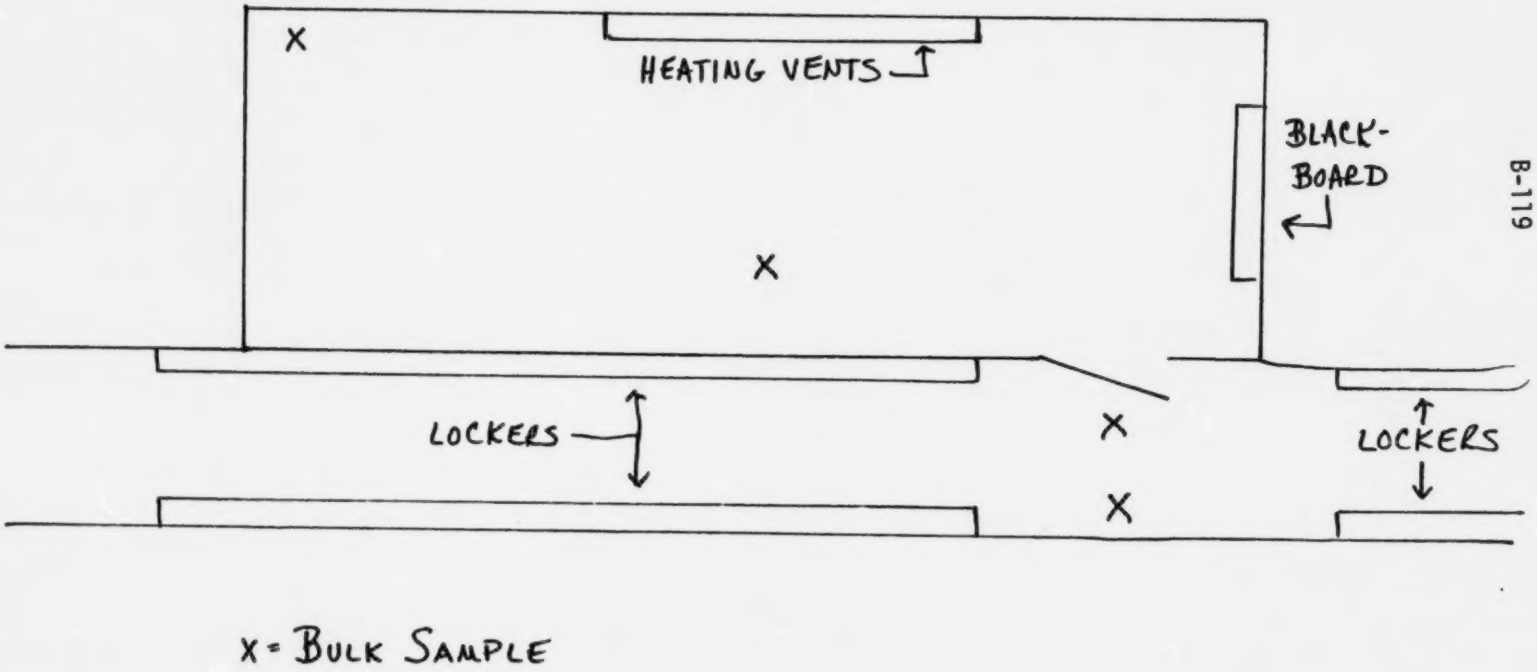
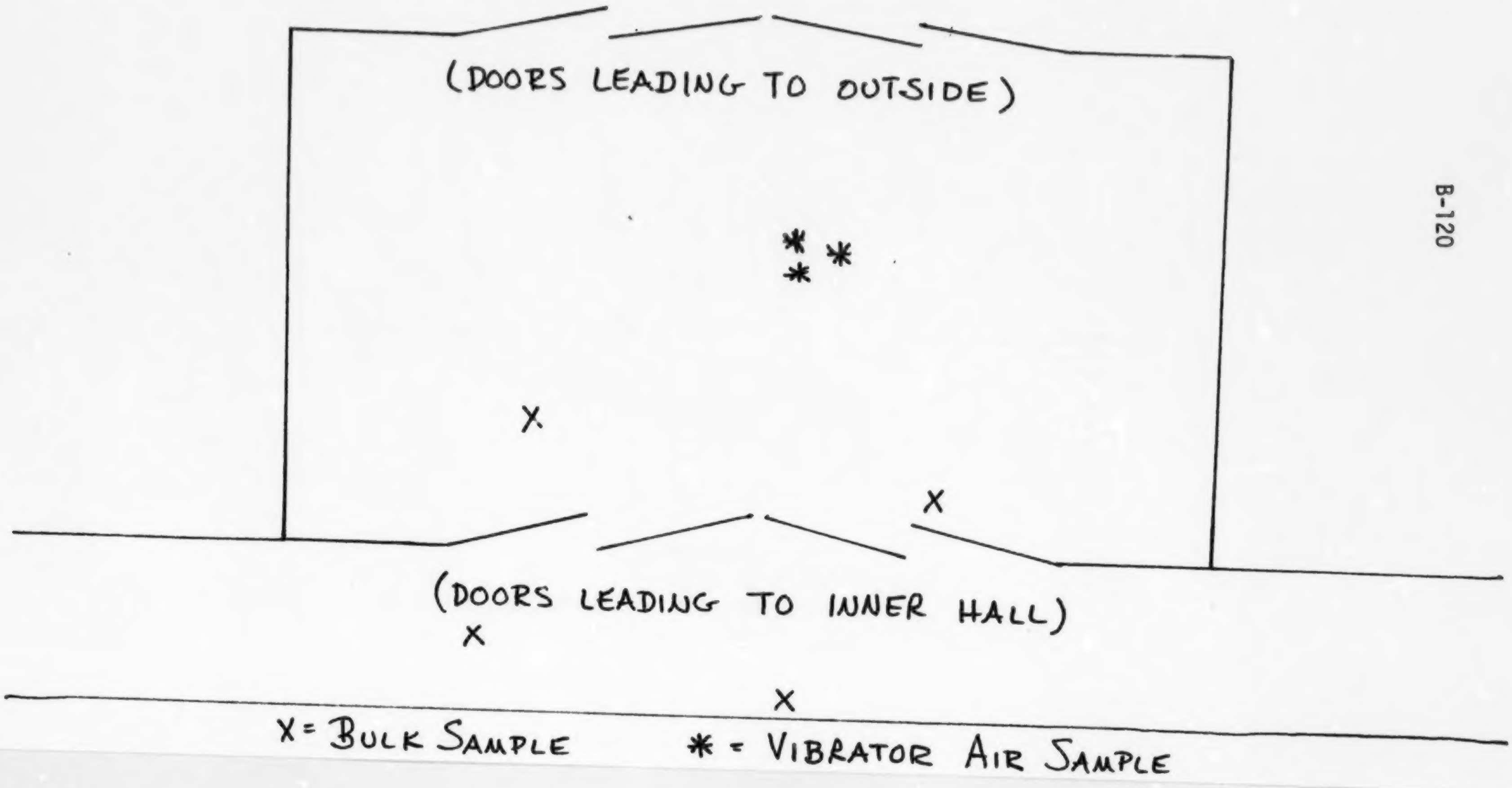

X
HEATING VENTS
BLACK-BOARD
X
LOCKERS
X
X
LOCKERS
X = BULK SAMPLE

FIGURE B-8. SAMPLING LOCATIONS AT SITE 25-01 (ENTRANCE HALL AND INNER HALL)


(DOORS LEADING TO OUTSIDE)
*
*
*
X
X
(DOORS LEADING TO INNER HALL)
X
X
X = BULK SAMPLE
* = VIBRATOR AIR SAMPLE

APPENDIX C

ANALYTICAL PROCEDURES

Polarized Light Microscopy

Bulk insulation samples were analyzed by polarized light microscopy (PLM) for all fiber content including asbestos, glass fiber, and mineral wool. Also, other constituents which were nonfibrous were identified and their concentrations estimated.

First, the bulk core sample was removed from the container and examined for homogeneity at low magnification with a stereo microscope and specimens were selected for polarized light microscopy. Initial examination in the PLM was performed on the specimen immersed in a 1.550 refractive index liquid of high dispersion without using crossed polars, but with plane polarized light. This refractive index liquid matches one index of refraction of chrysotile, the most prevalent form of asbestos in insulation; consequently, if no other forms were detected at this point, all asbestos was identified and its concentration estimated visually. Twenty to thirty fields were viewed, and the quantitation was done by making visual estimates of the area covered by the different materials.

When glass or mineral wool fibers were present it became evident under crossed polars where the isotropic glass is invisible. Chrysotile and other fibrous forms which are anisotropic are bright under polarized light. When all of the anisotropic fibers did not match the 1.55 refractive index liquid where properly oriented when illuminated with plane-polarized light, another specimen was taken from the sample and immersed in a refractive index liquid which matched one index of amosite, the second most prevalent type of asbestos used in insulation materials. Usually, if the asbestos was not identified as chrysotile, it was found to be amosite. In a few isolated cases, a few fibers of crocidolite were found. Crocidolite is easily identified by using a matching refractive index liquid and noting the negative sign of elongation when the first order red plate is inserted as the specimen is observed under crossed polars.

The most prevalent nonfibrous materials in the samples were calcite and gypsum, both of which are recognizable by their optical properties. Calcite was also identified by observing the evolution of CO_2 when a drop of 10 percent HCl was placed on a specimen.

Phase Microscopy

Phase microscopy was used to determine concentrations of fibers greater than 5 μm in length on filtered collections of air samples. No identification of the fiber type was made by this procedure. This is the standard NIOSH method described in the DHEW (NIOSH) publication, No.79-127, entitled "USPHS/NIOSH Membrane Filter Method for Evaluating Airborne Asbestos Fibers".

The phase microscopy (PM) method employs a phase microscope equipped with a Porton reticle to count fibers greater than 5.0 μm (with an aspect ratio or ratio of length to diameter greater than 3:1) over specific areas of cleared membrane filters. A radial section from the membrane filter used to collect air particulate from a measured volume of air was made transparent by mounting the section in 1:1 mixture of diethyl oxalate and dimethyl phthalate containing 0.05 g/ml of dissolved Millipore filter. The cleared filter section on a microscope slide and beneath a coverslip was scanned along the radius of the filter as fibers within either 30 or 100 fields delineated by the Porton reticle were counted. In Phase I 30 fields were used, and in Phase II 100 fields were used. One Porton reticle field area was 1/333 mm^2.

The effective area of the particular filter used was calculated and the number of fibers per cm^3 was determined by multiplying the fibers/ Porton reticle field by 333 times the filter area in mm^2 divided by the cm^3 of sampled air.

Transmission Electron Microscopy

Transmission electron microscopy (TEM) was employed to analyze collections of air particulate for asbestos content. Only asbestos fibers were analyzed by the TEM method which involves identification of the asbestos type by selected area electron diffraction (SAED) and energy dispersive X-ray analysis (EDS). Also, all sizes of asbestos fibers are detected by TEM because of the high resolving power of the TEM.

The steps in the TEM procedures employed were as follows:

(1) The 47-mm Millipore filter bearing collected air particulate from a known volume of air was submitted for microscopical analysis of asbestos content.

(2) A 90° radial section was cut from the Millipore filter, placed in a beaker and low-temperature ashed in oxygen plasma.

(3) The ash residue was suspended in 100 ml of filtered deionized water and dispersed by ultrasonification.

(4) Three aliquots, 10, 20, and 70 ml, were filtered separately to deposit the particulate uniformly over 0.1 μm pore size, 25 mm diameter Nuclepore filters. During filtration the Nuclepore filters were backed by 8.0 μm pore size Millipore filters to promote uniform flow with attendant uniform deposition of particulate over the Nuclepore surface.

(5) The Nuclepore filters bearing the deposits were coated with a carbon film by vapor deposition in a vacuum evaporator.

(6) A ≈ 3 x 3 mm piece was cut from each filter, placed on a 200-mesh electron microscope support grid, and the filter material was dissolved in chloroform by the Jaffe technique leaving the carbon film containing the particulate supported by the 200-mesh grid. This was the specimen which was analyzed by TEM.

(7) Specimen areas delineated by the very uniform electromesh grid openings were systematically scanned at 20,000 X magnification in the TEM to look for asbestos fibers. (A fiber is defined as a structure having at least a 3:1 aspect ratio.)

(8) When a fiber was encountered, its morphology was observed, and an attempt was made to obtain an SAED pattern. In all cases, the fibers analyzed were found to be chrysotile asbestos as indicated by the observed morphology and streaking of the spots in certain layer lines of the diffraction pattern.

(9) The length and width of each fiber identified as asbestos was measured and recorded.

(10) Either 100 fibers were counted and measured or 10 grid opening areas were scanned, whichever occurred first. In any case, no less than one grid opening area was scanned.

(11) Calculations were made to determine numbers of fibers and mass-per-unit volume of sampled air. Fiber lengths and widths were assigned to size classes and fiber length, width, and mass were plotted versus cumulative number percent on semilog paper. Mass was calculated by multiplying length times width in μm squared to obtain the fiber volume which was multiplied times the density (2.4 for chrysotile) to obtain mass in picograms. The area factor, the total Nuclepore filter area to one grid opening area, was multiplied by the number of fibers per grid opening area to obtain the number of fibers in the filtered aliquot. The number of fibers in the aliquot was multiplied by 4 because 1/4 of the original filter was taken for analysis and by the ratio of the total volume of suspended particulate to the filtered aliquot to obtain numbers of fibers per filter.

The formula for calculation of numbers of fibers per cubic meter of air thus becomes:

$$\frac{\dfrac{\text{Effective Nuclepore filter area}}{\text{Area of grid opening}} \times \dfrac{\text{Volume of ash suspension}}{\text{Volume of Aliquot}} \times \begin{array}{c}\text{4 x No. of fibers}\\ \text{per grid opening}\end{array}}{\text{Volume of air sampled}}$$

= Number of fibers/unit volume of sampled air.

By substituting the average sum of the masses of individual fibers per grid opening for numbers of fibers per grid opening, the mass-per-unit volume may be calculated.

(12) Analytical data reported from a TEM analysis are:
- Number of fibers and mass per cubic meter or centimeter of sampled air,
- Mean fiber length,
- Mean fiber diameter,
- Plots of fiber length, diameter, and mass versus cumulative number percent.

A computer program performs the calculations and plots.

APPENDIX D

ANALYSIS OF VARIABILITY ASSOCIATED WITH THE MEASUREMENT OF FIBER CONCENTRATION BY PHASE MICROSCOPY AND TRANSMISSION ELECTRON MICROSCOPY

The objective of this study was to evaluate the variation associated with Phase Microscopy (PM) and Transmission Electron Microscopy (TEM) measurement of fiber concentration on a filter. For the PM method, intra-filter variation was examined. Three sources of variation were analyzed:

(1) Between wedges
(2) Between radii within wedges
(3) Between groups of fields within radii.

The TEM analysis was based on a review of the EPA report 600/4-78-011 on "Preparation of Water Samples for Asbestos Fiber Counting by Electron Microscopy".

Data were collected to be used in estimating the components of variance, the total variation and the coefficient of variation associated with the Battelle procedure for PM analysis. The Battelle procedure employed in Phase I involved counting the fibers in 30 fields along a radius. The variation for this procedure was compared to the variation associated with the NIOSH recommended procedure that requires counting fibers in up to 100 fields along a radius.

Analysis of Phase Microscopy Measurement Variability

Method of Data Collection

Three filters were selected from the set of filters collected during initial sampling for the asbestos project. In the original analysis two of the filters showed fiber concentrations less than 0.09 fibers per cc of air. The third filter showed 0.17 fibers per cc of air. Filters expected to have different fiber concentrations were included in the variability study because the variability associated with a PM analysis is likely to be related to the concentration level.

From each filter three wedges each approximately 1/8 the size of the filter were randomly selected for PM analysis. On each wedge two radii were randomly selected. Along one of the radii, 30 fields were randomly selected and fibers in each field were counted. Along the other radius, the fibers were counted using the NIOSH recommended procedure:

> Count as many fields as necessary to yield a total count of 100 fibers. Exceptions: (a) count at least 20 fields even if you count more than 100 fibers, and (b) stop at 100 fields even if you haven't reached 100 fibers (Leidel, et al., 1979).

The fiber concentration levels of the filters used in the variability study were low, so 100 fields were always counted. The total number of fibers obtained by both counting methods was converted to fibers per cc of air sampled by the following formula:

$$\mathrm{AC} = \frac{[(\mathrm{FB}/\mathrm{FL}) - (\mathrm{BFB}/\mathrm{BFL})]\ (\mathrm{ECA})}{(10{,}000)\ (\mathrm{FR})\ (\mathrm{T})\ (\mathrm{MFA})}$$

where:

AC = Airborne fiber concentration in fibers 5>μm/cc.

BFB = Total number of fibers counted in the BFL fields of the blank or control filters in fibers > 5μm.

BFL = Total number of fields counted on the blank or control filters.

ECA = Effective collecting area of filter (855 mm^2 for a 37-mm filter with effective diameter of 33 mm).

FR = Pump flow rate in liters/min (lpm).

FB = Total number of fibers counted in the FL fields in fibers > 5 μm.

FL = Total number of fields counted on the filter.

MFA = Microscope count field in mm^2 (generally 0.003 to 0.006).

T = Sample collection time in minutes.

To provide information about intra-radius variability 90 of the 100 fields were randomly assigned to three groups of 30 fields each. The total number of fibers in each of the three groups produced three additional estimates, all from one radius, of the number of fibers per cc of sampled air.

In total, there were five estimates of the number of fibers per cc of air on each wedge. One of these estimates was produced by counting 30 fields along one radius on the wedge. The other four estimates were produced by counting along the second radius on the wedge. Three of the estimates were based on examination of 30 microscopic fields, and one of the estimates was based on examination of 100 fields. Since three wedges were selected from a filter, a total of 15 estimates was made for each filter. The data are given in Table D-1.

Statistical Analysis

Statistical Analysis of PM Data Based on 30 Fields. Fiber concentration estimates based on the examination of 30 microscopic fields were used to study the variability in Phase Microscopy measurements of fiber concentration on a filter. The recorded data are in units of fibers per cc of sampled air. However, each data point is the product of the number of fibers counted in 30 fields in a given radius and a constant conversion factor. Therefore, the basic data are actually count data.

Two methods were used to analyze the variability associated with PM analysis. The first method used a variance components model to separate out the effects due to wedges, radii within wedges, and group of 30 fields within a radius. The second method assumes a Poisson distribution for the count data and estimates the coefficient of variation directly. Both methods produced similar estimates for the coefficient of variation for the three filters studied.

TABLE D-1. PM DATA

Filter A, Fibers/cc

		Radius 1		Radius 2
		30 Fields Counted	100 Fields Counted	100 Fields Divided Into 3 Groups of 30 Each
Wedge	1	0.01	0.01	0.00
				0.01
				0.01
	2	0.00	0.00	0.00
				0.00
				0.00
	3	0.01	0.01	0.02
				0.01
				0.00

Filter B, Fibers/cc.

		Radius 1		Radius 2
		30 Fields Counted	100 Fields Counted	100 Fields Divided Into 3 Groups of 30 Each
Wedge	1	0.04	0.04	0.05
				0.03
				0.03
	2	0.04	0.03	0.03
				0.03
				0.03
	3	0.00	0.01	0.01
				0.01
				0.01

TABLE D-1. (Continued)

Filter C, Fibers/cc.

		Radius 1		Radius 2
		30 Fields Counted	100 Fields Counted	100 Fields Divided Into 3 Groups of 30 Each
Wedge	1	0.14	0.12	0.14
				0.05
				0.16
	2	0.06	0.09	0.10
				0.11
				0.06
	3	0.14	0.06	0.05
				0.09
				0.06

Analysis of the Components of Variance Model.

Let Y_{ijk} be the estimate of the number of fibers per cc of sampled air for the $k^{\underline{th}}$ group of 30 fields on the $j^{\underline{th}}$ radii on the $i^{\underline{th}}$ wedge. The model used for the variance components analysis is

$$Y_{ijk} = \mu + W_i + R_{j(i)} + \varepsilon_{k(ij)},$$

$$i = 1, 2, 3, \quad j = 1, 2$$

$$k = \begin{cases} 1 \text{ if } j = 1 \\ 1,2,3 \text{ if } j = 2, \end{cases}$$

where the $\{W_i\}$, $\{R_{j(i)}\}$ and $\{\varepsilon_{k(ij)}\}$ are mutually independent random variables with

$$E(W_i) = 0, \qquad V(W_i) = \sigma_w^2,$$

$$E(R_{j(i)}) = \sigma, \qquad V(R_{j(i)}) = \sigma_R^2,$$

$$E(\varepsilon_{k(ij)}) = 0, \qquad V(\varepsilon_{k(ij)}) = \sigma_\varepsilon^2 .$$

The symbol μ is the overall fiber concentration on the filter. W_i represents the difference between the fiber concentration on the $i^{\underline{th}}$ wedge and on the overall filter. $R_{j(i)}$ represents the difference between the fiber concentration on the $j^{\underline{th}}$ radius on the $i^{\underline{th}}$ wedge and the concentration on the overall $i^{\underline{th}}$ wedge. The component $\varepsilon_{k(ij)}$ is the sampling error associated with the $k^{\underline{th}}$ measurement on the $j^{\underline{th}}$ radius on the $i^{\underline{th}}$ wedge.

The analysis of variance table for the model is

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	Expected Mean Square
Wedges	SSW = $4\sum_{i=1}^{3}(\overline{Y}_{i..} - \overline{Y}_{...})^2$	2	MSW = SSW/2	$4\sigma_W^2 + 2.5\sigma_R^2 + \sigma_\varepsilon^2$
Radii/Wedges	SSR = $\sum_{i=1}^{3}\sum_{j=1}^{2}\sum_{k}(\overline{Y}_{i..} - \overline{Y}_{ij.})^2$	3	MSR = SSR/3	$1.5\sigma_R^2 + \sigma_\varepsilon^2$
Samples/Radii	SSE = $\sum_{i=1}^{3}\sum_{j=1}^{2}\sum_{k}(Y_{ijk} - \overline{Y}_{ij.})^2$	6	MSE = SSE/6	σ_ε^2
Total	$\sum_{i=1}^{3}\sum_{j=1}^{2}\sum_{k}(Y_{ijk} - \overline{Y}_{...})^2$	11	-	-

The estimates for the components of variance obtained from the table are

$$\hat{\sigma}_\varepsilon^2 = \text{MSE},$$

$$\hat{\sigma}_R^2 = (\text{MSR}-\text{MSE})/1.5,$$

and

$$\hat{\sigma}_W^2 = \{\text{MSW}-[2.5(\text{MSR}-\text{MSE})/1.5]-\text{MSE}\}/4.$$

The overall variance σ^2 can be estimated by dividing the total sum of squares by the total degrees of freedom, so

$$\hat{\sigma}^2 = \sum_{i-1}^{3}\sum_{j=1}^{2}\sum_{k}(Y_{ijk} - \overline{Y}_{...})^2/11.$$

The coefficient of variation for a given filter is estimated by $\hat{\sigma}/\overline{Y}_{...}$.

Analysis of the Poisson Model.

Since each Y_{ijk} is the product of a constant conversion factor and Y_{ijk} = the number of fibers counted in 30 fields, the coefficients of variation associated with Y_{ijk} and Y_{ijk} are equal. The Y_{ijk} are counts which can be modeled by the Poisson distribution in the following manner. Assuming that the distribution of fibers on a filter is uniform on circles centered at the middle of the filter, then the number of fibers in one microscopic field chosen at random is assumed to be $P(\lambda)$. Since Y_{ijk} is the sum of counts on 30 fields, it is assumed that $Y_{ijk} \sim P(30\cdot\lambda)$. (Note, the 30 fields do not constitute a random sample from the entire filter since they are restricted to one radius. However, the assumptuon of a uniform distribution of fibers on circles implies that the population of fields within a radius is identical to the population of fields on the entire filter. This leads to $Y_{ijk} \sim P(30\cdot\lambda)$.)

For a Poisson distribution $P(\lambda)$, the mean is λ and the variance is λ. Therefore, the coefficient of variation is $\sqrt{\lambda}/\lambda = 1/\sqrt{\lambda}$. Since the best estimate of $30\cdot\lambda$ is $\overline{Y}...$, the estimate of the coefficient of variation is $1/\sqrt{\overline{Y}...}$.

Statistical Analysis of PM Data Based on 100 Fields

Only one group of 100 fields was sampled in each wedge. Therefore, the components of variance due to wedges, radii within wedges and group of 100 fields within radii cannot be separated. However, an estimate of the total variability can be obtained, although it is based on only 2 degrees of freedom and not likely to be stable.

If Y_i is the observed number of fibers based on the group of 100 fields selected from wedge i, then the total variance is estimated by

$$\hat{\sigma}^2 = (1/2)\sum_{i=1}^{3}(Y_i - \overline{Y}.)^2.$$

The coefficient of variation is estimated by $\hat{\sigma}/\overline{Y}.$.

The Poisson model can also be used in this case where $Y_i \sim P(100\cdot\lambda)$. Then the estimate of the coefficient of variation is $1/\sqrt{\overline{Y}.}$.

Results

Analysis of Data Based on 30 Fields.

Components of Variance Model.

The analysis of variance tables based on the variance component model are given in Table D-2. The variance estimates obtained from the analysis of variance tables are in Table D-3. The within-radius variation is larger than the between-radii variation in all three filters. In Filters A and C it is larger than the between-wedges variation.

As shown in Table D-3, the overall variability σ^2 decreases as the fiber concentration decreases. This relationship between the mean and the variance is logical at low concentration levels. The measurement error in counting fibers should decrease as the number of fibers on the filter approaches zero. At higher concentration levels, however, the mean and variance may display a different relationship.

Because the mean and variance change together in this data set, the coefficient of variation (the standard deviation expressed as a percentage of the mean) is a useful measure of the amount of variation within a filter. Also given in Table D-3 is a plot of the coefficient of variation for a filter against the mean fiber concentration for the filter. The coefficient of variation increases rapidly for the lower fiber concentration levels. This reflects a substantial decrease in precision at low concentration levels. This lack of precision at low levels is evident in the 95 percent confidence intervals for μ presented in Table D-4, where the endpoints of the interval for Filter A differ by an order of magnitude.

TABLE D-2. ANALYSIS OF VARIANCE CALCULATIONS
(Data collected by the 30-field PM method.)

Filter A, μ=0.00583

Source	Sum of Squares	Degrees of Freedom	Mean Square
Wedges	0.000217	2	0.000109
Radii within wedges	0.000008	3	0.000003
Error	0.000267	6	0.000045
Total	0.000492	11	

Filter B, $\hat{\mu}$ = 0.02583

Source	Sum of Squares	Degrees of Freedom	Mean Square
Wedges	0.002067	2	0.001034
Radii within wedges	0.000158	3	0.000053
Error	0.002492	6	0.000045
Total	0.004717	11	

Filter C, $\hat{\mu}$ = 0.09667

Source	Sum of Squares	Degrees of Freedom	Mean Square
Wedges	0.004017	2	0.002009
Radii within wedges	0.005015	3	0.001672
Error	0.018267	6	0.001539
Total	0.027299	11	

TABLE D-3. VARIANCE ESTIMATES FOR DATA COLLECTED BY THE 30-FIELD PM METHOD

Filter

	A	B	C
$\hat{\mu}$	0.00583	0.02583	0.09667
$\hat{\sigma}^2_W$	0.000026	0.000244	0.000062
$\hat{\sigma}^2_R$	0.000000	0.000005	0.000089
$\hat{\sigma}^2_\varepsilon$	0.000045	0.000045	0.001539
$\hat{\sigma}^2$	0.000045	0.000227	0.001661
Coefficient of Variation	115%	58%	42%

TABLE D-4. ESTIMATES OF 95 PERCENT CONFIDENCE INTERVALS FOR μ

(Data collected by the 30-field PM method.)

Filter

	A	B	C
$\hat{\mu}$	0.00583	0.02583	0.09667
95% confidence interval	(0.00140, 0.01026)	(0.01583, 0.03583)	(0.06962, 0.12372)

Poisson Model.

Coefficient of variation estimates using the Poisson model are given in Table D-5.

TABLE D-5. COEFFICIENT OF VARIATION ESTIMATES BASED ON THE POISSON MODEL

(Data collected by the 30-field PM Method.)

Filter

	A	B	C
$\hat{\mu}$	0.00583	0.02583	0.09667
Coefficient of Variation	110%	53%	36%

The estimates based on the Poisson Model are very close to the estimates in Table D-3. The variance components model produced similar estimates and appears to be comparable with the Poisson model.

Analysis of Data Based on 100-Fields.

The variance estimates made from data collected by the NIOSH PM method are in Table D-6. These are estimates of overall variances, and they are not associated with particular sources of variation.

TABLE D-6. VARIANCE ESTIMATES FOR DATA COLLECTED BY THE NIOSH PM METHOD

Filter

	A	B	C
$\hat{\mu}$	0.00667	0.02667	0.09000
$\hat{\sigma}^2$	0.000033	0.000233	0.000900
Coefficient of Variation	86%	57%	33%

Comparison of the 30-Field and 100-Field PM Procedures.

Since the 100-field PM procedure samples more of the filter than the 30-field method, an increase in precision is expected. This increase in precision is reflected in the sample estimates of the coefficient of variation for Filters A, B, and C. For A the coefficient of variation dropped from 115 percent to 86 percent, for B from 58 percent to 57 percent, and for C from 42 percent to 33 percent. As noted before, the estimates based on 100 fields are not stable. This comparison is only a rough indication of the increase that might be obtained by using 100 fields instead of 30.

As shown in Table D-6, the variances estimated from data collected using 100 fields increase as the mean fiber concentration levels increase. The coefficient of variation decreases as the mean increases. This pattern is consistent with the results from analysis of data collected by using the 30-field method.

Analysis of Transmission Electron Microscopy Variability

Transmission electron microscopy is also used to analyze the fiber concentrations on filters used in air sampling. An analysis similar to that performed for PM is needed to assess the variability associated with the TEM technique.

The protocol followed by the Battelle Columbus Laboratories is essentially identical to that described as the OFR Ashing Technique in the Environmental Protection Agency report EPA-600/4-78-001, January, 1978. This report is entitled "Preparation of Water Samples for Asbestos Fiber Counting by Electron Microscopy".

A sampling study of this procedure was performed, and the results were presented in the EPA report. Since this technique is so similar to the technique used for analysis of air samples, a Battelle study of TEM variability is not required.

In the EPA report, the OFR ashing technique was applied to ten filters created using standardized aqueous dispersions of chrysolite, crocidolite, and taconite fibers. Ten samples were taken from each filter, and a variability study was performed using these samples. For these studies the coefficients of variation ranged from 30 percent to 40 percent.

Since there is no direct relationship between concentration levels observed in the air samples and those in water samples, a comparison of TEM to PM is difficult. The estimated coefficients of variation for TEM were smaller than those observed for the PM analysis. It would appear, however, that there is not a significant increase in precision using the TEM technique.

References for Appendix D

Leidel, N.A., S.G. Bayer, R.D. Zumwalde, and K.A. Busch. 1979. USPHS/NIOSH Membrane Filter Method for Evaluating Airborne Asbestos Fibers. NIOSH Technical Publication 79-127.

APPENDIX E

STATISTICAL PROCEDURES

Statistical Analysis of Bulk Sampling Data

The statistical methods used in the analysis of bulk sampling data are described in this section.

Mean/Variance Relationship

Graphical techniques are used to investigate the relationship between the variability associated with the measurement of asbestos content and the amount of asbestos present. The amount of asbestos at the i^{th} sampling site is estimated by the mean $\overline{X}_{i\cdot}$ of the observations X_{ij} made at the site,

$$(1) \qquad \overline{X}_{i\cdot} = \left(\sum_{j=1}^{N_i} X_{ij}\right)/N_i,$$

where N_i is the number of observations made at the i^{th} site. The variability at the i^{th} site is estimated by the variance S_i^2 ,

$$(2) \qquad S_i^2 = \sum_{j=1}^{N_i} (X_{ij}-\overline{X}_{i\cdot})^2/n_i$$

where $n_i = N_i-1$.

The sample variances S_i^2 are plotted against the sample means $\overline{X}_{i\cdot}$ using data from eight sampling sites in Figure 4 of the text and using data from all 40 sampling sites in Figure 5. Patterns that appear in the plots are interpreted in the Bulk Sampling Section of the report.

Components of Variance

Analysis of variance techniques are used to estimate the total variation associated with the measurement of asbestos, the variation due to sampling location and the variation due to laboratory procedure. The data collected at eight sampling sites is used in the analysis. This subset of data supplies information about the two sources of variation that contribute to the total variation.

The results in the Bulk Sampling Section of the report show that the variance is not constant across sampling sites. Consequently, the data is not pooled across sites. A components of variance analysis is done individually for each of the eight sites. A formulation of the variance components problem in mathematical notation follows.

Let Y_{ij} be the estimate of the percentage of asbestos for the j^{th} laboratory analysis of the bulk sample taken at the i^{th} location in the ceiling of a given sampling site. The model for the components of variance analysis is

$$Y_{ij} = \mu + L_i + \varepsilon_{j(i)}, \tag{3}$$

$$i = 1,2,3,4 \text{ and } j = 1,2,3,4,$$

where the L_i and $\varepsilon_{j(i)}$ are mutually independent random variables with

$$E(L_i) = 0,\ V(L_i) = \sigma_L^2, \tag{4}$$

$$E(\varepsilon_{j(i)}) = 0,\ V(\varepsilon_{j(i)}) = \sigma_\varepsilon^2. \tag{5}$$

The symbol μ is the overall percentage of asbestos in the ceiling. L_i represents the difference between the percentage of asbestos at the i^{th} location and the overall percentage of asbestos. The component $\varepsilon_{j(i)}$ is the sampling error associated with the j^{th} laboratory analysis of the bulk sample taken at the i^{th} location.

D and V Statistics

D Statistic

The choice of a measure of rater disagreement is not straightforward. The proper ordering of distinct configurations of raters' scores with respect to the amount of disagreement is not obvious. For example, suppose a factor can be scored on an ordinal scale as either 1,2,3, or 4. If four judges independently rate a site with respect to the factor, four of the possible configurations of scores are given on the following page. It is not obvious how to rank these four configurations in terms of the amount of disagreement they reflect. The statistic used to measure the amount of disagreement will implicitly impart an ordering on all possible configurations of scores. Therefore, the statistic must be chosen carefully so that it orders the various configurations in a reasonable way.

Another important consideration to be addressed in this problem is the types of inferences that can be made from the observed agreement scores. With nominal scale data the failure of the paradigm to measure anythink meaningful would be equivalent to the raters arbitrarily assigning their scores. However, with ordinal scale data it is not clear that a unique reference point exists when the scale fails to measure anything meaningful. For example, if some of the possible scores are associated with extremes (such as severe damage), then raters may tend to score moderately when the rating scale is not measuring anything meaningful. In this case a high degree of agreement would be observed. Thus, a high agreement rate does not necessarily imply that the rating scale is measuring something meaningful. Under these circumstances some additional convincing information would be required to make that judgment.

In view of the above discussion, the following statistic is proposed as a measure of rater disagreement. For a given factor scored at a given site, let X_i be the factor score from the i^{th} rater. Compute

$$\overline{D} = \frac{2}{r(r-1)} \sum_{i=1}^{r} \sum_{j>i} |X_i - X_j|$$

where r is the number of raters. $\overline{D}$ is the average size of the disagreement observed among the r raters. Let P be the proportion of agreements and

		Score			
		1	2	3	4
A:	J_1	x			
	J_2	x			
	J_3	x			
	J_4	x			x
B:	J_1	x			
	J_2	x			
	J_3				x
	J_4				x
C:	J_1	x			
	J_2	x			
	J_3			x	
	J_4				x
D:	J_1	x			
	J_2		x		
	J_3			x	
	J_4				x

take as the overall measure of disagreement for the sites

$$D = (1-P)\overline{D}$$

D takes the average size of the disagreements and weighs it by the percentage of disagreement. The values of D can then be averaged over all sites to obtain an overall measure of disagreement for the factor. If there is perfect agreement among the raters, then D = 0, while disagreement among raters will be reflected in positive values of D.

Before D is adopted for use, the characteristics of the ordering it imparts on the various configurations of scores should be considered. In terms of configurations A,B,C, and D, the corresponding measures are $D_A = 0.75$, $D_B = 1.33$, $D_C = 1.52$, and $D_D = 1.67$, respectively. With respect to this measure, configuration A is most consistent and configuration D shows the most disagreement. D appears to be a reasonable summary statistic.

However, as previously discussed, a low value for D will not necessarily indicate that the rating scale is measuring a meaningful concept. It reflects consistency of the raters scoring, but this may be an artifact of a tendency to score moderate values in the absence of any real meaning of the factors. If a low value of D is observed, then the scores over individual sites should be studied in an attempt to discover any pattern of moderate scoring. If such a pattern does not exist, then the observed low value of D could be attributed to the fact that the rating scale is measuring some meaningful concept.

V Statistic

The V statistic is introduced to partially compensate for the problem of values of V near zero resulting from moderate scoring of a meaningless rating scale. A standard score indicating the true physical conditions at a site is included in the calculation of the V statistic. In this study scores by one Battelle rater are chosen as the standard scores.

For a given factor scored as a given site, let T be true factor score for the site and X_i be the factor score from the i^{th} rater. Compute

$$V = \frac{1}{r} \sum_{i=1}^{r} \left| X_i - T \right|$$

where r is the number of raters scoring the site. V is the average size of the disagreement observed between raters and truth. If raters perfectly agree with the true score, than V = 0, while disagreement with the true score will be indicated by positive values of V.

Friedman's Procedure for a Two-Way Layout

The D (and V) statistics computed for each factor are compared in the Internal Consistency Section using Friedman's procedure (Hollander, et al. 1973). One D (or V) statistic exists for each of the K=7 factors at each of the n sites. The data can be modeled as

$$D_{ij} = r + \beta_i + \tau_j + e_{ij},$$
$$i = 1, \ldots n,$$
$$j = 1, \ldots k,$$

where r is the unknown overall mean, β_i is the effect of the i^{th} site (the B's are unknown nuisance parameters), τ_j is the unknown effect of the j^{th} factor. The e's are assumed to be mutually independent, and each e is assumed to come from the same continuous population.

To test the null hypothesis that the factor effects are all equal, that is

$$H_o: \tau_1 = \tau_2 = \ldots. = \tau_k,$$

against the alternatives that the factor effects are not all equal;

1. Within each site, rank the D statistics from least to greatest. Let r_{ij} denote the rank of D_{ij} in the joint ranking of $D_{i1}, \ldots, D_{ik}$.

2. Set

   $$R_j = \sum_{i=1}^{n} r_{ij}, \quad R_{.j} = \frac{R_j}{n}, \quad R_{..} = \frac{k + 1}{2}.$$

   Thus, for example , R_2 is the sum (over the n blocks) of ranks received by factor 2 and $R_{.2}$ is the average rank obtained by factor 2.

3. Compute

   $$S = \frac{12n}{k(k + 1)} \sum_{i=1}^{k} (R_{.j} - R_{..})^2,$$

   S has an asymptotic chi-square distribution.

Wilcoxon Signed Rank Test

Paired comparisons of D (and V) statistics are made in the Internal Consistency Section using the Wilcoxon Signed Rank Test (Hollander, et al. 1973). In making paired comparisons, such as trained raters versus untrained raters, two D (or V) statistics exist for each of n sampling sites. Let D_{1i} be the D statistic observed at the i^{th} site for one group of raters and D_{2i} be the D statistic observed at the i^{th} site for the second group of raters. Let $Z_i = D_{2i} - D_{1i}$, and task as the model

$$Z_i = \theta + e_i, \quad i = 1, \ldots, n,$$

where the e's are unobservable random variables and the parameter of interest θ is the unknown effect of the rater group. The e's are assumed to be mutually independent, and each e is assumed to come from a continuous population (not necessarily the same one) that is symmetric about zero.

To test the null hypothesis of no effect due to rater group, that is,

$$H_0: \theta = 0;$$

1. Form the absolute differences $|Z_1|, \ldots, |Z_n|$. Let R_i denote the rank of $|Z_i|$ in the joint ranking from least to greatest of $|Z_1|, \ldots, |Z_n|$.
2. Define indicator variables ψ_i, i = 1, ..., n, where

$$\psi_i = \begin{cases} 1 & \text{if } Z_i > 0 \\ 0 & \text{if } Z_i < 0. \end{cases}$$

3. Form the n products $R_1\psi_1, \ldots, R_n\psi_n$, and set

$$T = \sum_{i=1}^{n} R_i\psi_i. \tag{3}$$

The product $R_i\psi_i$ is known as the positive signed rank of Z_i. It takes on the value zero if $|Z_i|$ is negative and is equal to the rank of $|Z_i|$ when Z_i is positive. The statistic T is the sum of the positive signed ranks. T has an asymtotic normal distribution.

Reference for Appendix E

Hollander, Myles, and Wolfe, Douglas. 1973. "Nonparametric Statistical Methods". John Wiley and Sons, New York.

APPENDIX F

DATA PLOTTED ON FIGURES 6 THROUGH 12

TABLE F-1. RAW DATA USED IN FIGURE 6.

Sampling Site Identification				Weighted Factor Scores											
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted.% Asbestos	Average of Asbestos	Exposure Score	Average Vibrator Air Sample	LN (Average Vibrator Air Sample)
8.	1.	1.	5.	5.	1.	2.	0	4.	2.	2.	3.	75.	84.	269.9	5.60
8.	1.	1.	5.	5.	3.	3.	0	4.	2.	2.	3.	75.	144.	269.9	5.60
8.	2.	1.	5.	5.	1.	2.	0	4.	0	1.	2.	30.	44.	560.6	6.33
8.	2.	1.	5.	2.	1.	2.	0	4.	1.	0	2.	30.	32.	560.6	6.33
8.	3.	1.	5.	0	1.	0	0	4.	0	1.	0	1.	0	3.5	1.25
8.	3.	1.	5.	0	1.	1.	0	4.	0	0	0	1.	0	3.5	1.25
8.	4.	1.	5.	2.	1.	1.	0	4.	0	1.	2.	30.	16.	28.2	3.34
8.	4.	1.	5.	2.	1.	2.	0	4.	1.	1.	2.	30.	36.	28.2	3.34
8.	5.	1.	5.	5.	1.	2.	0	4.	2.	2.	2.	30.	56.	62.5	4.14
8.	5.	1.	5.	5.	1.	2.	0	1.	2.	2.	2.	30.	44.	62.5	4.14
8.	6.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	30.	32.	232.0	5.45
8.	6.	1.	5.	2.	1.	2.	0	4.	1.	2.	2.	30.	40.	232.6	5.45
9.	1.	1.	5.	2.	1.	0	0	4.	0	0	2.	10.	0	6.1	1.81
9.	1.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	6.1	1.81
9.	2.	1.	5.	0	1.	0	0	4.	0	1.	2.	10.	0	9.9	2.29
9.	2.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	9.9	2.29
9.	3.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	57.2	4.05
9.	3.	1.	5.	2.	1.	0	0	4.	1.	0	2.	10.	0	57.2	4.05
10.	1.	1.	5.	2.	1.	2.	0	4.	0	0	3.	70.	42.	36.0	3.58
10.	1.	1.	5.	2.	3.	2.	0	4.	0	0	3.	70.	54.	36.0	3.58
10.	2.	1.	5.	2.	1.	2.	0	4.	0	1.	3.	70.	48.	63.6	4.15
10.	2.	1.	5.	2.	1.	2.	0	4.	0	2.	3.	70.	54.	63.6	4.15
11.	1.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	45.	32.	164.7	4.65
11.	1.	1.	5.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	104.7	4.65
11.	2.	1.	5.	5.	3.	2.	1.	4.	0	2.	2.	50.	63.	61.9	4.13
11.	2.	1.	5.	5.	1.	3.	1.	4.	0	2.	2.	50.	78.	61.9	4.13
14.	1.	1.	1.	2.	1.	2.	0	4.	0	1.	3.	60.	48.	164.4	5.10
14.	1.	1.	3.	2.	1.	2.	0	4.	0	1.	3.	60.	48.	164.4	5.10
14.	1.	1.	3.	5.	1.	2.	0	4.	0	1.	3.	60.	66.	164.4	5.10
14.	1.	1.	3.	5.	1.	3.	0	4.	0	2.	3.	60.	108.	164.4	5.10
14.	1.	1.	3.	2.	1.	3.	0	4.	0	2.	3.	60.	81.	164.4	5.10
14.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	3.	60.	99.	164.4	5.10
14.	2.	1.	1.	2.	0	2.	0	4.	0	0	3.	55.	36.	226.6	5.42
14.	2.	1.	3.	2.	1.	2.	0	4.	0	1.	3.	55.	48.	226.6	5.42
14.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	3.	55.	72.	226.6	5.42
14.	2.	1.	3.	2.	1.	3.	0	4.	0	1.	3.	55.	72.	226.6	5.42
14.	2.	1.	3.	5.	1.	3.	0	4.	0	1.	3.	55.	99.	226.6	5.42
14.	2.	1.	3.	5.	1.	3.	0	4.	1.	1.	3.	55.	103.	226.6	5.42
14.	3.	1.	1.	2.	1.	2.	0	4.	0	0	2.	45.	29.	205.7	5.33
14.	3.	1.	3.	5.	1.	2.	0	4.	2.	1.	2.	45.	52.	205.7	5.33
14.	3.	1.	3.	5.	1.	2.	0	4.	1.	1.	2.	45.	48.	205.7	5.33
14.	3.	1.	3.	2.	1.	3.	0	4.	2.	2.	2.	45.	66.	205.7	5.33
14.	3.	1.	3.	5.	1.	3.	0	4.	2.	1.	2.	45.	78.	205.7	5.33
14.	3.	1.	3.	5.	1.	3.	0	4.	1.	1.	2.	45.	72.	205.7	5.33
15.	1.	1.	1.	5.	1.	2.	0	4.	1.	1.	2.	45.	48.	127.7	4.85
15.	1.	1.	3.	5.	3.	2.	0	4.	0	2.	2.	45.	56.	127.7	4.85
15.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	127.7	4.85
15.	1.	1.	3.	5.	1.	3.	0	4.	0	2.	2.	45.	72.	127.7	4.85
15.	1.	1.	3.	5.	3.	3.	0	4.	0	2.	2.	45.	84.	127.7	4.85
15.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	127.7	4.85
15.	1.	2.	1.	5.	1.	2.	0	4.	1.	1.	3.	85.	72.	238.7	5.48
15.	1.	2.	3.	5.	3.	2.	0	4.	0	2.	3.	85.	84.	238.7	5.48
15.	1.	2.	3.	5.	1.	3.	0	4.	0	1.	3.	85.	99.	238.7	5.48
15.	1.	2.	3.	5.	1.	3.	0	4.	0	2.	3.	85.	108.	238.7	5.48
15.	1.	2.	3.	5.	3.	3.	0	4.	0	2.	3.	85.	126.	238.7	5.48
15.	1.	2.	3.	5.	1.	3.	0	4.	0	1.	3.	85.	99.	238.7	5.48

TABLE F-1. (Continued)

Sampling Site Identification				Weighted FActor Scores											
Bldg	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expone	Water	Activity	Wghted. % Asbestos	Average of Asbestos	Exposure Score	Average Vibrator Air Sample	LN (Average Vibrator Air Sample)
15.	3.	1.	1.	5.	1.	2.	0	4.	0	0	2.	33.	40.	156.5	5.05
15.	3.	1.	3.	5.	1.	2.	0	4.	0	0	2.	33.	40.	156.5	5.05
15.	3.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	33.	66.	156.5	5.05
15.	3.	1.	3.	5.	1.	3.	0	4.	0	0	2.	33.	60.	156.5	5.05
15.	3.	1.	3.	5.	3.	3.	0	4.	0	0	2.	33.	72.	156.5	5.05
15.	3.	1.	3.	5.	1.	3.	0	4.	0	0	2.	33.	60.	156.5	5.05
16.	1.	1.	1.	2.	1.	1.	0	4.	0	2.	2.	8.	18.	3.1	1.14
16.	1.	1.	3.	0	1.	1.	0	4.	0	1.	2.	8.	12.	3.1	1.14
16.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	8.	16.	3.1	1.14
16.	1.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	8.	18.	3.1	1.14
16.	1.	1.	3.	2.	1.	2.	0	4.	0	2.	2.	8.	36.	3.1	1.14
16.	1.	1.	3.	2.	1.	2.	0	4.	2.	1.	2.	8.	40.	3.1	1.14
16.	2.	1.	1.	5.	1.	1.	0	4.	2.	1.	2.	10.	26.	1.0	0
16.	2.	1.	3.	2.	3.	1.	0	4.	2.	2.	2.	10.	26.	1.0	0
16.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	10.	32.	1.0	0
16.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	10.	32.	1.0	0
16.	2.	1.	3.	5.	3.	2.	0	4.	2.	2.	2.	10.	64.	1.0	0
16.	2.	1.	3.	5.	1.	1.	0	4.	2.	2.	2.	10.	28.	1.0	0
16.	3.	1.	1.	2.	1.	1.	0	4.	0	1.	2.	10.	16.	.8	-.27
16.	3.	1.	3.	2.	1.	2.	0	4.	0	1.	2.	10.	32.	.8	-.27
16.	3.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	10.	16.	.8	-.27
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	.8	-.27
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	.8	-.27
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	.8	-.27
16.	4.	1.	1.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.	2.0	.69
16.	4.	1.	3.	5.	1.	1.	0	4.	1.	1.	2.	5.	24.	2.0	.69
16.	4.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	5.	18.	2.0	.69
16.	4.	1.	3.	2.	1.	1.	0	4.	1.	2.	2.	5.	26.	2.0	.69
16.	4.	1.	3.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.	2.0	.69
16.	4.	1.	3.	2.	1.	1.	0	4.	2.	1.	2.	5.	20.	2.0	.69
17.	1.	1.	1.	5.	1.	2.	0	4.	2.	1.	0	0	0	1.9	.64
17.	1.	1.	3.	5.	1.	3.	0	4.	2.	1.	0	0	0	1.9	.64
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	1.9	.64
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	1.9	.64
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	1.9	.64
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	1.9	.64
17.	2.	1.	1.	5.	1.	2.	0	4.	2.	1.	0	0	0	2.1	.76
17.	2.	1.	3.	5.	3.	3.	0	4.	1.	1.	0	0	0	2.1	.76
17.	2.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	2.1	.76
17.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	0	0	0	2.1	.76
17.	2.	1.	3.	5.	1.	3.	0	4.	2.	2.	0	0	0	2.1	.76
17.	2.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	2.1	.76
17.	3.	1.	1.	5.	3.	2.	0	4.	1.	1.	0	0	0	.9	-.11
17.	3.	1.	3.	5.	3.	3.	0	4.	0	2.	0	0	0	.9	-.11
17.	3.	1.	3.	5.	3.	2.	0	4.	0	2.	0	0	0	.9	-.11
17.	3.	1.	3.	5.	1.	2.	0	4.	0	2.	0	0	0	.9	-.11
17.	3.	1.	3.	5.	3.	2.	0	4.	0	2.	0	0	0	.9	-.11
17.	3.	1.	3.	5.	1.	2.	0	4.	0	1.	0	0	0	.9	-.11
19.	1.	1.	1.	0	3.	1.	0	4.	0	2.	2.	8.	18.	.1	-2.01
19.	1.	1.	3.	2.	3.	0	0	4.	0	2.	2.	8.	0	.1	-2.01
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	.1	-2.01
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	.1	-2.01
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	.1	-2.01
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	.1	-2.01
19.	2.	1.	1.	2.	3.	1.	1.	4.	0	2.	2.	25.	24.	1.5	.41
19.	2.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	25.	28.	1.5	.41

TABLE F-1. (Continued)

Sampling Site Identification			Type of	Weighted Factor Scores							Wghted. %	Average of	Exposure	Average Vibrator	LN (Average Vibrator
Bldg.	Site	Sampling Location	Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	Asbestos	Score	Air Sample	Air Sample)
19.	2.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	25.	28.	1.5	.41
19.	2.	1.	3.	2.	3.	1.	0	4.	0	1.	2.	25.	20.	1.5	.41
19.	2.	1.	3.	5.	3.	1.	0	4.	0	1.	2.	25.	26.	1.5	.41
19.	2.	1.	3.	5.	3.	1.	0	4.	0	1.	2.	25.	26.	1.5	.41
20.	1.	1.	1.	5.	1.	1.	1.	4.	2.	2.	0	0	0	.5	-.63
20.	1.	1.	3.	5.	1.	2.	1.	4.	2.	2.	0	0	0	.5	-.63
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	.5	-.63
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	.5	-.63
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	.5	-.63
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	.5	-.63
20.	2.	1.	1.	2.	1.	1.	1.	4.	2.	1.	2.	3.	22.	.4	-1.60
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	.4	-1.60
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	.4	-1.00
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	.4	-1.06
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	.4	-1.00
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	.4	-1.00
20.	3.	1.	1.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	.5	-.69
20.	3.	1.	3.	5.	1.	2.	1.	4.	2.	1.	2.	3.	56.	.5	-.69
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	.5	-.69
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	.5	-.69
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	.5	-.69
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	.5	-.69
20.	3.	2.	1.	5.	1.	1.	1.	4.	2.	2.	0	0	0	.4	-1.00
20.	3.	2.	3.	5.	1.	2.	1.	4.	2.	1.	0	0	0	.4	-1.06
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	.4	-1.00
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	.4	-1.00
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	.4	-1.00
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	.4	-1.00
20.	4.	1.	1.	5.	1.	1.	1.	4.	2.	1.	0	0	0	2.4	.88
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	2.4	.88
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	2.4	.88
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	2.4	.88
20.	4.	1.	3.	2.	1.	1.	1.	4.	2.	2.	0	0	0	2.4	.88
20.	4.	1.	3.	2.	1.	1.	1.	4.	2.	1.	0	0	0	2.4	.88
21.	1.	1.	1.	0	1.	2.	0	4.	0	1.	2.	8.	24.	1.6	.49
21.	2.	1.	1.	0	1.	2.	0	4.	0	1.	2.	13.	24.	2.8	1.03
21.	3.	1.	1.	0	1.	2.	0	4.	0	1.	2.	5.	24.	1.4	.34
21.	4.	1.	1.	0	1.	2.	0	4.	0	0	2.	5.	20.	2.8	1.03
21.	5.	1.	1.	0	1.	2.	0	4.	0	1.	2.	13.	24.	.8	-.22
22.	1.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0	4.2	1.44
22.	2.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0	3.3	1.19
22.	3.	1.	1.	0	0	2.	0	0	0	1.	0	0	0	4.7	1.55
22.	4.	1.	1.	0	0	2.	0	0	0	1.	0	0	0	6.9	1.94
22.	5.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0	5.2	1.64
23.	1.	1.	1.	0	1.	1.	1.	4.	0	0	0	0	0	.3	-1.32
23.	2.	1.	1.	5.	1.	1.	1.	4.	0	0	2.	3.	22.	.8	-.22
23.	3.	1.	1.	0	1.	1.	1.	4.	0	0	2.	8.	12.	2.0	.71
24.	2.	1.	1.	2.	1.	1.	0	4.	1.	2.	2.	30.	20.	.1	-2.01
24.	2.	1.	3.	5.	1.	0	0	4.	0	1.	2.	30.	0	.1	-2.01
24.	2.	1.	3.	5.	1.	1.	0	4.	0	1.	2.	30.	22.	.1	-2.01
24.	2.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	30.	10.	.1	-2.01
24.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	30.	32.	.1	-2.01
24.	2.	1.	3.	5.	1.	0	0	4.	0	2.	2.	30.	0	.1	-2.01
26.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	2.	40.	52.	1.4	.34
27.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	3.	55.	78.	2.4	.88
28.	2.	1.	1.	2.	1.	2.	0	4.	0	1.	2.	10.	32.	17.4	2.85
29.	1.	1.	1.	2.	1.	3.	0	4.	0	2.	3.	80.	81.	39.6	3.66

TABLE F-2. AVERAGES PLOTTED IN FIGURE 6.

Sampling Site Identfctn			Averages		
Bldg.	Site	Sampling Location	Weighted Friablty	Vibrator Air Sample	Ln(Vibrator Air Sample)
8.	1.	1.	2.50	270.	5.60
8.	2.	1.	2.00	561.	6.33
8.	3.	1.	.50	4.	1.25
8.	4.	1.	1.50	28.	3.34
8.	5.	1.	2.00	63.	4.14
8.	6.	1.	2.00	232.	5.45
9.	1.	1.	.50	6.	1.81
9.	2.	1.	.50	10.	2.29
9.	3.	1.	.50	57.	4.05
10.	1.	1.	2.00	36.	3.58
10.	2.	1.	2.00	64.	4.15
11.	1.	1.	2.50	105.	4.65
11.	2.	1.	2.50	62.	4.13
14.	1.	1.	2.50	164.	5.10
14.	2.	1.	2.50	227.	5.42
14.	3.	1.	2.50	206.	5.33
15.	1.	1.	2.67	128.	4.85
15.	1.	2.	2.67	239.	5.48
15.	3.	1.	2.67	156.	5.05
16.	1.	1.	1.33	3.	1.14
16.	2.	1.	1.17	1.	0
16.	3.	1.	1.17	1.	-.27
16.	4.	1.	1.00	2.	.69
17.	1.	1.	2.17	2.	.64
17.	2.	1.	2.33	2.	.76
17.	3.	1.	2.17	1.	-.11
19.	1.	1.	.83	.	-2.01
19.	2.	1.	1.00	2.	.41
20.	1.	1.	1.17	1.	-.63
20.	2.	1.	1.00	.	-1.00
20.	3.	1.	1.17	1.	-.69
20.	3.	2.	1.17	.	-1.60
20.	4.	1.	1.00	2.	.38
21.	1.	1.	2.00	2.	.49
21.	2.	1.	2.00	3.	1.03
21.	3.	1.	2.00	1.	.34
21.	4.	1.	2.00	3.	1.03
21.	5.	1.	2.00	1.	-.22
22.	1.	1.	2.00	4.	1.44
22.	2.	1.	2.00	3.	1.19
22.	3.	1.	2.00	5.	1.55
22.	4.	1.	2.00	7.	1.94
22.	5.	1.	2.00	5.	1.64
23.	1.	1.	1.00	.	-1.32
23.	2.	1.	1.00	1.	-.22
23.	3.	1.	1.00	2.	.71
24.	2.	1.	.67	.	-2.01
26.	1.	1.	2.00	1.	.34
27.	1.	1.	2.00	2.	.88
28.	2.	1.	2.00	17.	2.85
29.	1.	1.	3.00	39.	3.66

TABLE F-3. RAW DATA USED IN FIGURE 7.

Sampling Site Identification				Weighted Factor Scores									
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Average % Asbestos	Exposure Score
6.	1.	1.	5.	5.	1.	2.	0	4.	2.	1.	2.	36.	52.
6.	2.	1.	5.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.
7.	1.	1.	5.	2.	1.	1.	0	4.	1.	2.	2.	8.	20.
7.	2.	1.	5.	2.	1.	0	0	4.	1.	1.	2.	5.	0
7.	3.	1.	5.	2.	1.	1.	0	4.	1.	1.	2.	8.	18.
8.	1.	1.	5.	5.	1.	2.	0	4.	2.	2.	3.	75.	84.
8.	1.	1.	5.	5.	3.	3.	0	4.	2.	2.	3.	75.	144.
8.	2.	1.	5.	5.	1.	2.	0	4.	0	1.	2.	30.	44.
8.	2.	1.	5.	2.	1.	2.	0	4.	1.	0	2.	30.	32.
8.	3.	1.	5.	0	1.	0	0	4.	0	1.	0	1.	0
8.	3.	1.	5.	0	1.	1.	0	4.	0	0	0	1.	0
8.	4.	1.	5.	2.	1.	1.	0	4.	0	1.	2.	30.	16.
8.	4.	1.	5.	2.	1.	2.	0	4.	1.	1.	2.	30.	36.
8.	5.	1.	5.	5.	1.	2.	0	4.	2.	2.	2.	30.	56.
8.	5.	1.	5.	5.	1.	2.	0	1.	2.	2.	2.	30.	44.
8.	6.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	30.	32.
8.	6.	1.	5.	2.	1.	2.	0	4.	1.	2.	2.	30.	40.
9.	1.	1.	5.	2.	1.	0	0	4.	0	0	2.	10.	0
9.	1.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.
9.	2.	1.	5.	0	1.	0	0	4.	0	1.	2.	10.	0
9.	2.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.
9.	3.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.
9.	3.	1.	5.	2.	1.	0	0	4.	1.	0	2.	10.	0
10.	1.	1.	5.	2.	1.	2.	0	4.	0	0	3.	70.	42.
10.	1.	1.	5.	2.	3.	2.	0	4.	0	0	3.	70.	54.
10.	2.	1.	5.	2.	1.	2.	0	4.	0	1.	3.	70.	48.
10.	2.	1.	5.	2.	1.	2.	0	4.	0	2.	3.	70.	54.
11.	1.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	45.	32.
11.	1.	1.	5.	5.	1.	3.	0	4.	0	1.	2.	45.	66.
11.	2.	1.	5.	5.	3.	2.	1.	4.	0	2.	2.	50.	60.
11.	2.	1.	5.	5.	1.	3.	1.	4.	0	2.	2.	50.	78.
14.	1.	1.	1.	2.	1.	2.	0	4.	0	1.	3.	60.	48.
14.	1.	1.	3.	2.	1.	2.	0	4.	0	1.	3.	60.	48.
14.	1.	1.	3.	5.	1.	2.	0	4.	0	1.	3.	60.	66.
14.	1.	1.	3.	5.	1.	3.	0	4.	0	2.	3.	60.	108.
14.	1.	1.	3.	2.	1.	3.	0	4.	0	2.	3.	60.	81.
14.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	3.	60.	99.
14.	2.	1.	1.	2.	0	2.	0	4.	0	0	3.	55.	36.
14.	2.	1.	3.	2.	1.	2.	0	4.	0	1.	3.	55.	48.
14.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	3.	55.	72.
14.	2.	1.	3.	2.	1.	3.	0	4.	0	1.	3.	55.	72.
14.	2.	1.	3.	5.	1.	3.	0	4.	0	1.	3.	55.	99.
14.	2.	1.	3.	5.	1.	3.	0	4.	1.	1.	3.	55.	108.
14.	3.	1.	1.	2.	1.	2.	0	4.	0	0	2.	45.	28.
14.	3.	1.	3.	5.	1.	2.	0	4.	2.	1.	2.	45.	52.
14.	3.	1.	3.	5.	1.	2.	0	4.	1.	1.	2.	45.	48.
14.	3.	1.	3.	2.	1.	3.	0	4.	2.	2.	2.	45.	66.
14.	3.	1.	3.	5.	1.	3.	0	4.	2.	1.	2.	45.	78.
14.	3.	1.	3.	5.	1.	3.	0	4.	1.	1.	2.	45.	72.
15.	1.	1.	1.	5.	1.	2.	0	4.	1.	1.	2.	45.	48.
15.	1.	1.	3.	5.	3.	2.	0	4.	0	2.	2.	45.	56.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	45.	66.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	2.	2.	45.	72.
15.	1.	1.	3.	5.	3.	3.	0	4.	0	2.	2.	45.	84.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	45.	66.
15.	1.	2.	1.	5.	1.	2.	0	4.	1.	1.	3.	85.	72.

TABLE F-3. (Continued)

Sampling Site Identification				Weighted Factor Scores							Wghted. %	Average	Exposure
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Asbestos	% Asbestos	Score
15.	1.	2.	3.	5.	3.	2.	0	4.	0	2.	3.	85.	84.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	1.	3.	85.	99.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	2.	3.	85.	108.
15.	1.	2.	3.	5.	3.	3.	0	4.	0	2.	3.	85.	126.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	1.	3.	85.	99.
15.	3.	1.	1.	5.	1.	2.	0	4.	0	0	2.	33.	40.
15.	3.	1.	3.	5.	1.	2.	0	4.	0	0	2.	33.	48.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	33.	66.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	0	2.	33.	63.
15.	3.	1.	3.	5.	3.	3.	0	4.	0	0	2.	33.	72.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	0	2.	33.	60.
16.	1.	1.	1.	2.	1.	1.	0	4.	0	2.	2.	8.	18.
16.	1.	1.	3.	0	1.	1.	0	4.	0	1.	2.	8.	12.
16.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	8.	16.
16.	1.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	8.	18.
16.	1.	1.	3.	2.	1.	2.	0	4.	0	2.	2.	8.	36.
16.	1.	1.	3.	2.	1.	2.	0	4.	2.	1.	2.	8.	40.
15.	2.	1.	1.	5.	1.	1.	0	4.	2.	1.	2.	10.	26.
16.	2.	1.	3.	2.	3.	1.	0	4.	2.	2.	2.	10.	26.
16.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	10.	32.
16.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	10.	32.
16.	2.	1.	3.	5.	3.	2.	0	4.	2.	2.	2.	10.	64.
16.	2.	1.	3.	5.	1.	1.	0	4.	2.	2.	2.	10.	29.
16.	2.	2.	1.	5.	1.	1.	0	4.	2.	1.	2.	3.	26.
16.	2.	2.	3.	2.	3.	1.	0	4.	2.	2.	2.	3.	28.
16.	2.	2.	3.	5.	3.	1.	0	4.	2.	2.	2.	3.	32.
16.	2.	2.	3.	5.	3.	1.	0	4.	2.	2.	2.	3.	32.
16.	2.	2.	3.	5.	3.	2.	0	4.	2.	2.	2.	3.	64.
16.	2.	2.	3.	5.	1.	1.	0	4.	2.	2.	2.	3.	20.
16.	3.	1.	1.	2.	1.	1.	0	4.	0	1.	2.	10.	16.
16.	3.	1.	3.	2.	1.	2.	0	4.	0	1.	2.	10.	32.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	10.	16.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.
16.	4.	1.	1.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.
16.	4.	1.	3.	5.	1.	1.	0	4.	1.	1.	2.	5.	24.
16.	4.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	5.	18.
16.	4.	1.	3.	2.	1.	1.	0	4.	1.	2.	2.	5.	20.
16.	4.	1.	3.	2.	1.	1.	0	4.	2.	[illegible]	2.	5.	22.
16.	4.	1.	3.	2.	1.	1.	0	4.	2.	[illegible]	2.	5.	20.
17.	1.	1.	1.	5.	1.	2.	0	4.	2.	1.	0	0	0
17.	1.	1.	3.	5.	1.	3.	0	4.	2.	1.	0	0	0
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0
17.	2.	1.	1.	5.	1.	2.	0	4.	1.	1.	0	0	0
17.	2.	1.	3.	5.	3.	3.	0	4.	2.	1.	0	0	0
17.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	0	0	0
17.	2.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0
17.	2.	1.	3.	5.	1.	3.	0	4.	2.	2.	0	0	0
17.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	0	0	0
17.	3.	1.	1.	5.	3.	2.	0	4.	0	1.	0	0	0
17.	3.	1.	3.	5.	3.	3.	0	4.	0	2.	0	0	0
17.	3.	1.	3.	5.	3.	2.	0	4.	0	2.	0	0	0

TABLE F-3. (Continued)

Sampling Site Identification				Weighted Factor Scores									
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Average % Asbestos	Exposure Score
17.	3.	1.	3.	5.	1.	2.	0	4.	0	2.	0	0	0
17.	3.	1.	3.	5.	3.	2.	0	4.	0	2.	0	0	0
17.	3.	1.	3.	5.	1.	2.	0	4.	0	1.	0	0	0
18.	1.	1.	1.	5.	3.	1.	0	4.	0	2.	2.	13.	28.
18.	2.	1.	1.	2.	1.	1.	0	4.	2.	1.	2.	15.	20.
19.	1.	1.	1.	0	3.	1.	0	4.	0	2.	2.	8.	18.
19.	1.	1.	3.	2.	3.	0	0	4.	0	2.	2.	8.	0
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.
19.	2.	1.	1.	2.	3.	1.	1.	4.	0	2.	2.	25.	24.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	25.	28.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	25.	28.
19.	2.	1.	3.	2.	3.	1.	0	4.	0	1.	2.	25.	20.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	1.	2.	25.	26.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	1.	2.	25.	26.
20.	1.	1.	1.	5.	1.	1.	1.	4.	2.	2.	0	0	0
20.	1.	1.	3.	5.	1.	2.	1.	4.	2.	2.	0	0	0
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0
20.	2.	1.	1.	2.	1.	1.	1.	4.	2.	1.	2.	3.	22.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	29.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	29.
20.	3.	1.	1.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.
20.	3.	1.	3.	5.	1.	2.	1.	4.	2.	1.	2.	3.	56.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.
20.	3.	2.	1.	5.	1.	1.	1.	4.	2.	2.	0	0	0
20.	3.	2.	3.	5.	1.	2.	1.	4.	2.	1.	0	0	0
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0
20.	4.	1.	1.	5.	1.	1.	1.	4.	2.	1.	0	0	0
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0
20.	4.	1.	3.	2.	1.	1.	1.	4.	2.	2.	0	0	0
20.	4.	1.	3.	2.	1.	1.	1.	4.	2.	1.	0	0	0
21.	1.	1.	1.	0	1.	2.	0	4.	0	1.	2.	8.	24.
21.	2.	1.	1.	0	1.	2.	0	4.	0	1.	2.	13.	24.
21.	3.	1.	1.	0	1.	2.	0	4.	0	1.	2.	5.	24.
21.	4.	1.	1.	0	1.	2.	0	4.	0	0	2.	5.	20.
21.	5.	1.	1.	0	1.	2.	0	4.	0	1.	2.	13.	24.
22.	1.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0
22.	2.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0
22.	3.	1.	1.	0	0	2.	0	0	0	1.	0	0	0
22.	4.	1.	1.	0	0	2.	0	0	0	1.	0	0	0

TABLE F-3. (Continued)

Sampling Site Identification				Weighted Factor Scores									
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Average % Asbestos	Exposure Score
22.	5.	1.	1.	0	3	2.	1.	0	0	1.	0	0	0
23.	1.	1.	1.	0	1.	1.	1.	4.	0	0	0	0	0
23.	2.	1.	1.	5.	1.	1.	1.	4.	0	0	2.	3.	22.
23.	3.	1.	1.	0	1.	1.	1.	4.	0	0	2.	8.	12.
24.	1.	1.	1.	5.	1.	1.	0	4.	2.	1.	2.	15.	26.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.
24.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	15.	22.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	15.	18.
24.	1.	2.	1.	5.	1.	1.	0	4.	2.	1.	3.	60.	39.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.
24.	1.	2.	3.	2.	3.	1.	0	4.	0	2.	3.	60.	33.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	2.	3.	60.	27.
24.	2.	1.	1.	2.	1.	1.	0	4.	1.	2.	2.	30.	28.
24.	2.	1.	3.	5.	1.	0	0	4.	0	1.	2.	30.	0
24.	2.	1.	3.	5.	1.	1.	0	4.	0	1.	2.	30.	22.
24.	2.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	30.	18.
24.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	30.	32.
24.	2.	1.	3.	5.	1.	0	0	4.	0	2.	2.	30.	0
24.	3.	1.	1.	2.	1.	0	0	4.	0	2.	2.	30.	0
24.	3.	1.	3.	5.	1.	0	0	4.	2.	0	2.	30.	0
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.
24.	3.	1.	3.	5.	1.	0	0	4.	2.	1.	2.	30.	0
25.	1.	1.	1.	2.	3.	0	0	4.	0	1.	2.	15.	0
25.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.
25.	1.	1.	3.	2.	3.	1.	0	4.	0	1.	2.	15.	20.
25.	1.	1.	3.	2.	3.	0	0	4.	0	2.	2.	15.	0
25.	1.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	15.	28.
25.	1.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	15.	18.
25.	2.	1.	1.	2.	1.	0	0	4.	1.	1.	2.	20.	0
25.	2.	1.	3.	2.	1.	2.	0	4.	0	1.	2.	20.	32.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.
25.	2.	1.	3.	2.	1.	1.	0	4.	2.	2.	2.	20.	22.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.
26.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	2.	40.	52.
27.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	3.	55.	78.
28.	2.	1.	1.	2.	1.	2.	0	4.	0	1.	2.	18.	32.
29.	1.	1.	1.	2.	1.	3.	0	4.	0	2.	3.	80.	81.

TABLE F-4. AVERAGES PLOTTED IN FIGURE 7.

Sampling Site Identfctn			Averages	
Bldg.	Site	Sampling Location	Weighted Friablty	% Asbestos
6.	1.	1.	2.00	30.
6.	2.	1.	1.00	5.
7.	1.	1.	1.00	8.
7.	2.	1.	0	5.
7.	3.	1.	1.50	8.
8.	1.	1.	2.50	75.
8.	2.	1.	2.00	30.
8.	3.	1.	.50	1.
8.	4.	1.	1.50	30.
8.	5.	1.	2.00	30.
8.	6.	1.	2.00	30.
9.	1.	1.	.50	10.
9.	2.	1.	.50	10.
9.	3.	1.	.50	10.
10.	1.	1.	2.00	70.
10.	2.	1.	2.00	70.
11.	1.	1.	2.50	45.
11.	2.	1.	2.50	50.
14.	1.	1.	2.50	60.
14.	2.	1.	2.50	55.
14.	3.	1.	2.50	45.
15.	1.	1.	2.67	45.
15.	1.	2.	2.67	85.
15.	3.	1.	2.67	33.
16.	1.	1.	1.33	8.
16.	2.	1.	1.17	10.
16.	2.	2.	1.17	3.
16.	3.	1.	1.17	10.
16.	4.	1.	1.00	5.
17.	1.	1.	2.17	0
17.	2.	1.	2.33	0
17.	3.	1.	2.17	0
18.	1.	1.	1.00	13.
18.	2.	1.	1.00	15.
19.	1.	1.	.83	8.
19.	2.	1.	1.00	25.
20.	1.	1.	1.17	0
20.	2.	1.	1.00	3.
20.	3.	1.	1.17	3.
20.	3.	2.	1.17	0
20.	4.	1.	1.00	0
21.	1.	1.	2.00	8.
21.	2.	1.	2.00	13.
21.	3.	1.	2.00	5.
21.	4.	1.	2.00	5.
21.	5.	1.	2.00	13.
22.	1.	1.	2.00	0
22.	2.	1.	2.00	0
22.	3.	1.	2.00	0
22.	4.	1.	2.00	0
22.	5.	1.	2.00	0
23.	1.	1.	1.00	0
23.	2.	1.	1.00	3.
23.	3.	1.	1.00	8.
24.	1.	1.	1.00	15.
24.	1.	2.	1.00	60.

TABLE F-4. (Continued)

Sampling Site Identfctn			Averages	
Bldg.	Site	Sampling Location	Weighted Friablty	% Asbestos
24.	2.	1.	.67	30.
24.	3.	1.	.50	30.
25.	1.	1.	.67	15.
25.	2.	1.	1.00	20.
26.	1.	1.	2.00	40.
27.	1.	1.	2.00	55.
28.	2.	1.	2.00	10.
29.	1.	1.	3.00	80.

TABLE F-5. DATA PLOTTED IN FIGURE 8.

Sampling Site Identification				Weighted Factor Scores												
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Exposure Score	Average % Asbestos	LN (Average % Asbestos)	Average Vibrator Air Sample	LN (Average Vibrator Air Sample)
8.	1.	1.	5.	5.	1.	2.	0	4.	2.	2.	3.	84.	75.	4.3	269.9	5.60
8.	2.	1.	5.	5.	1.	2.	0	4.	0	1.	2.	44.	30.	3.4	560.6	6.33
8.	4.	1.	5.	2.	1.	1.	0	4.	0	1.	2.	16.	30.	3.4	28.2	3.34
8.	5.	1.	5.	5.	1.	2.	0	4.	2.	2.	2.	56.	30.	3.4	62.5	4.14
8.	6.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	32.	30.	3.4	232.0	5.45
9.	1.	1.	5.	2.	1.	0	0	4.	0	0	2.	0	10.	2.3	6.1	1.81
9.	2.	1.	5.	0	1.	0	0	4.	0	1.	2.	0	10.	2.3	9.9	2.29
9.	3.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	16.	10.	2.3	57.2	4.05
10.	1.	1.	5.	2.	1.	2.	0	4.	0	0	3.	42.	← 70.	4.2	36.0	3.58
10.	2.	1.	5.	2.	1.	2.	0	4.	0	1.	3.	48.	70.	4.2	63.6	4.15
11.	1.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	32.	45.	3.8	104.7	4.65
11.	2.	1.	5.	5.	3.	2.	1.	4.	0	2.	2.	60.	50.	3.9	61.9	4.13
14.	1.	1.	1.	2.	1.	2.	0	4.	0	1.	3.	48.	60.	4.1	164.4	5.10
14.	2.	1.	1.	2.	0	2.	0	4.	0	0	3.	36.	55.	4.0	226.6	5.42
14.	3.	1.	1.	2.	1.	2.	0	4.	0	0	2.	28.	45.	3.8	205.7	5.33
15.	1.	1.	1.	5.	1.	2.	0	4.	1.	1.	2.	48.	45.	3.8	127.7	4.85
15.	1.	2.	1.	5.	1.	2.	0	4.	1.	1.	3.	72.	85.	4.4	238.7	5.48
15.	3.	1.	1.	5.	1.	2.	0	4.	0	0	2.	40.	33.	3.5	156.5	5.05
16.	1.	1.	1.	2.	1.	1.	0	4.	0	2.	2.	13.	8.	2.1	3.1	1.14
16.	2.	1.	1.	5.	1.	1.	0	4.	2.	1.	2.	26.	10.	2.3	1.0	0
16.	3.	1.	1.	2.	1.	1.	0	4.	0	1.	2.	16.	10.	2.3	.8	-.27
16.	4.	1.	1.	2.	1.	1.	0	4.	2.	2.	2.	22.	5.	1.6	2.0	.69
19.	1.	1.	1.	0	3.	1.	0	4.	0	2.	2.	13.	8.	2.1	.1	-2.01
19.	2.	1.	1.	2.	3.	1.	1.	4.	0	2.	2.	24.	25.	3.2	1.5	.41
20.	2.	1.	1.	2.	1.	1.	1.	4.	2.	1.	2.	22.	3.	1.1	.4	-1.00
20.	3.	1.	1.	5.	1.	1.	1.	4.	2.	2.	2.	30.	3.	1.1	.5	-.69
21.	1.	1.	1.	0	1.	2.	0	4.	0	1.	2.	24.	8.	2.1	1.6	.49
21.	2.	1.	1.	0	1.	2.	0	4.	0	1.	2.	24.	13.	2.6	2.8	1.03
21.	3.	1.	1.	0	1.	2.	0	4.	0	1.	2.	24.	5.	1.6	1.4	.34
21.	4.	1.	1.	0	1.	2.	0	4.	0	0	2.	20.	5.	1.6	2.8	1.03
21.	5.	1.	1.	0	1.	2.	0	4.	0	1.	2.	24.	13.	2.6	.8	-.22
23.	2.	1.	1.	5.	1.	1.	1.	4.	0	0	2.	22.	3.	1.1	.8	-.22
23.	3.	1.	1.	0	1.	1.	1.	4.	0	0	2.	12.	8.	2.1	2.0	.71
24.	2.	1.	1.	2.	1.	1.	0	4.	1.	2.	2.	20.	30.	3.4	.1	-2.01
26.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	2.	52.	40.	3.7	1.4	.34
27.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	3.	78.	55.	4.0	2.4	.88
28.	2.	1.	1.	2.	1.	2.	0	4.	0	1.	2.	32.	18.	2.9	17.4	2.85
29.	1.	1.	1.	2.	1.	3.	0	4.	0	2.	3.	81.	80.	4.4	39.0	3.66

TABLE F-6. RAW DATA USED IN FIGURE 9.

Sampling Site Identification				Weighted Factor Scores										
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Average % Asbestos	Exposure Score	% Total Mineral Fiber
6.	1.	1.	5.	5.	1.	2.	0	4.	2.	1.	2.	30.	52.	30.
6.	2.	1.	5.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.	5.
7.	1.	1.	5.	2.	1.	1.	0	4.	1.	2.	2.	8.	20.	8.
7.	2.	1.	5.	2.	1.	0	0	4.	1.	1.	2.	5.	0	5.
7.	3.	1.	5.	2.	1.	1.	0	4.	1.	1.	2.	8.	18.	8.
8.	1.	1.	5.	5.	1.	2.	0	4.	2.	2.	3.	75.	84.	75.
8.	1.	1.	5.	5.	3.	3.	0	4.	2.	2.	3.	75.	144.	75.
8.	2.	1.	5.	5.	1.	2.	0	4.	0	1.	2.	30.	44.	30.
8.	2.	1.	5.	2.	1.	2.	0	4.	1.	0	2.	30.	32.	30.
8.	3.	1.	5.	0	1.	0	0	4.	0	1.	0	1.	0	1.
8.	3.	1.	5.	0	1.	1.	0	4.	0	0	0	1.	0	1.
8.	4.	1.	5.	2.	1.	1.	0	4.	0	1.	2.	30.	16.	30.
8.	4.	1.	5.	2.	1.	2.	0	4.	1.	1.	2.	30.	36.	30.
8.	5.	1.	5.	5.	1.	2.	0	4.	2.	2.	2.	30.	56.	30.
8.	5.	1.	5.	5.	1.	2.	0	1.	2.	2.	2.	30.	44.	30.
8.	6.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	30.	32.	30.
8.	6.	1.	5.	2.	1.	2.	0	4.	1.	2.	2.	30.	40.	30.
9.	1.	1.	5.	2.	1.	0	0	4.	0	0	2.	10.	0	10.
9.	1.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	10.
9.	2.	1.	5.	0	1.	0	0	4.	0	1.	2.	10.	0	10.
9.	2.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	10.
9.	3.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	10.
9.	3.	1.	5.	2.	1.	0	0	4.	1.	0	2.	10.	0	10.
10.	1.	1.	5.	2.	1.	2.	0	4.	0	0	3.	70.	42.	70.
10.	1.	1.	5.	2.	3.	2.	0	4.	0	0	3.	70.	54.	70.
10.	2.	1.	5.	2.	1.	2.	0	4.	0	1.	3.	70.	48.	70.
10.	2.	1.	5.	2.	1.	2.	0	4.	0	2.	3.	70.	54.	70.
11.	1.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	45.	32.	45.
11.	1.	1.	5.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	45.
11.	2.	1.	5.	5.	3.	2.	1.	4.	0	2.	2.	50.	60.	50.
11.	2.	1.	5.	5.	1.	3.	1.	4.	0	2.	2.	50.	78.	50.
14.	1.	1.	1.	2.	1.	2.	0	4.	0	1.	3.	60.	48.	90.
14.	1.	1.	3.	2.	1.	2.	0	4.	0	1.	3.	60.	49.	90.
14.	1.	1.	3.	5.	1.	2.	0	4.	0	1.	3.	60.	66.	90.
14.	1.	1.	3.	5.	1.	3.	0	4.	0	2.	3.	60.	108.	90.
14.	1.	1.	3.	2.	1.	3.	0	4.	0	2.	3.	60.	81.	90.
14.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	3.	60.	99.	90.
14.	2.	1.	1.	2.	0	2.	0	4.	0	0	3.	55.	36.	90.
14.	2.	1.	3.	2.	1.	2.	0	4.	0	1.	3.	55.	48.	90.
14.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	3.	55.	72.	90.
14.	2.	1.	3.	2.	1.	3.	0	4.	0	1.	3.	55.	72.	90.
14.	2.	1.	3.	5.	1.	3.	0	4.	0	1.	3.	55.	99.	90.
14.	2.	1.	3.	5.	1.	3.	0	4.	1.	1.	3.	55.	108.	90.
14.	3.	1.	1.	2.	1.	2.	0	4.	0	0	2.	45.	28.	85.
14.	3.	1.	3.	5.	1.	2.	0	4.	2.	1.	2.	45.	52.	85.
14.	3.	1.	3.	5.	1.	2.	0	4.	1.	1.	2.	45.	48.	85.
14.	3.	1.	3.	2.	1.	3.	0	4.	2.	2.	2.	45.	66.	85.
14.	3.	1.	3.	5.	1.	3.	0	4.	2.	1.	2.	45.	78.	85.
14.	3.	1.	3.	5.	1.	3.	0	4.	1.	1.	2.	45.	72.	85.
15.	1.	1.	1.	5.	1.	2.	0	4.	1.	1.	2.	45.	48.	75.
15.	1.	1.	3.	5.	3.	2.	0	4.	0	2.	2.	45.	56.	75.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	75.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	2.	2.	45.	72.	75.
15.	1.	1.	3.	5.	3.	3.	0	4.	0	2.	2.	45.	84.	75.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	75.
15.	1.	2.	1.	5.	1.	2.	0	4.	1.	1.	3.	85.	72.	86.

TABLE F-6. (Continued)

Sampling Site Identification				Weighted Factor Scores										
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Average % Asbestos	Exposure Score	% Total Mineral Fiber
15.	1.	2.	3.	5.	3.	2.	0	4.	0	2.	3.	85.	84.	86.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	1.	3.	85.	99.	86.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	2.	3.	85.	108.	86.
15.	1.	2.	3.	5.	3.	3.	0	4.	0	2.	3.	85.	126.	86.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	1.	3.	85.	99.	86.
15.	3.	1.	1.	5.	1.	2.	0	4.	0	0	2.	33.	40.	58.
15.	3.	1.	3.	5.	1.	2.	0	4.	0	0	2.	33.	40.	58.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	33.	66.	58.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	0	2.	33.	60.	58.
15.	3.	1.	3.	5.	3.	3.	0	4.	0	0	2.	33.	72.	58.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	0	2.	33.	60.	58.
16.	1.	1.	1.	2.	1.	1.	0	4.	0	2.	2.	8.	18.	8.
16.	1.	1.	3.	0	1.	1.	0	4.	0	1.	2.	8.	12.	8.
16.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	8.	16.	8.
16.	1.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	8.	18.	8.
16.	1.	1.	3.	2.	1.	2.	0	4.	0	2.	2.	8.	36.	8.
16.	1.	1.	3.	2.	1.	2.	0	4.	2.	1.	2.	8.	40.	8.
16.	2.	1.	1.	5.	1.	1.	0	4.	2.	1.	2.	10.	26.	15.
16.	2.	1.	3.	2.	3.	1.	0	4.	2.	2.	2.	10.	26.	15.
16.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	10.	32.	15.
16.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	10.	32.	15.
16.	2.	1.	3.	5.	3.	2.	0	4.	2.	2.	2.	10.	64.	15.
16.	2.	1.	3.	5.	1.	1.	0	4.	2.	2.	2.	10.	28.	15.
16.	2.	2.	1.	5.	1.	1.	0	4.	2.	1.	2.	3.	26.	13.
16.	2.	2.	3.	2.	3.	1.	0	4.	2.	2.	2.	3.	26.	13.
16.	2.	2.	3.	5.	3.	1.	0	4.	2.	2.	2.	3.	32.	13.
16.	2.	2.	3.	5.	3.	1.	0	4.	2.	2.	2.	3.	32.	13.
16.	2.	2.	3.	5.	3.	2.	0	4.	2.	2.	2.	3.	64.	13.
16.	2.	2.	3.	5.	1.	1.	0	4.	2.	2.	2.	3.	28.	13.
16.	3.	1.	1.	2.	1.	1.	0	4.	0	1.	2.	10.	16.	20.
16.	3.	1.	3.	2.	1.	2.	0	4.	0	1.	2.	10.	32.	20.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	10.	16.	20.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	20.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	20.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	20.
16.	4.	1.	1.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.	15.
16.	4.	1.	3.	5.	1.	1.	0	4.	1.	1.	2.	5.	24.	15.
16.	4.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	5.	18.	15.
16.	4.	1.	3.	2.	1.	1.	0	4.	1.	2.	2.	5.	20.	15.
16.	4.	1.	3.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.	15.
16.	4.	1.	3.	2.	1.	1.	0	4.	2.	1.	2.	5.	20.	15.
17.	1.	1.	1.	5.	1.	2.	0	4.	2.	1.	0	0	0	0
17.	1.	1.	3.	5.	1.	3.	0	4.	2.	1.	0	0	0	0
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	0
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	0
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	0
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	0
17.	2.	1.	1.	5.	1.	2.	0	4.	1.	1.	0	0	0	0
17.	2.	1.	3.	5.	3.	3.	0	4.	2.	1.	0	0	0	0
17.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	0	0	0	0
17.	2.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	0
17.	2.	1.	3.	5.	1.	3.	0	4.	2.	2.	0	0	0	0
17.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	0	0	0	0
17.	3.	1.	1.	5.	3.	2.	0	4.	0	1.	0	0	0	0
17.	3.	1.	3.	5.	3.	3.	0	4.	0	2.	0	0	0	0
17.	3.	1.	3.	5.	3.	2.	0	4.	0	2.	0	0	0	0

TABLE F-6. (Continued)

Sampling Site Identification				Weighted Factor Scores										
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Average % Asbestos	Exposure Score	% Total Mineral Fiber
17.	3.	1.	3.	5.	1.	2.	0	4.	0	2.	0	0	0	0
17.	3.	1.	3.	5.	3.	2.	0	4.	0	2.	0	0	0	0
17.	3.	1.	3.	5.	1.	2.	0	4.	0	1.	0	0	0	0
18.	1.	1.	1.	5.	3.	1.	0	4.	0	2.	2.	13.	28.	16.
18.	2.	1.	1.	2.	1.	1.	0	4.	2.	1.	2.	15.	20.	23.
19.	1.	1.	1.	0	3.	1.	0	4.	0	2.	2.	8.	18.	8.
19.	1.	1.	3.	2.	3.	0	0	4.	0	2.	2.	8.	0	8.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	5.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	8.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	8.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	8.
19.	2.	1.	1.	2.	3.	1.	1.	4.	0	2.	2.	25.	24.	28.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	25.	29.	28.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	25.	28.	28.
19.	2.	1.	3.	2.	3.	1.	0	4.	0	1.	2.	25.	20.	28.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	1.	2.	25.	26.	28.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	1.	2.	25.	26.	28.
20.	1.	1.	1.	5.	1.	1.	1.	4.	2.	2.	0	0	0	0
20.	1.	1.	3.	5.	1.	2.	1.	4.	2.	2.	0	0	0	0
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	0
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	0
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	0
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	0
20.	2.	1.	1.	2.	1.	1.	1.	4.	2.	1.	2.	3.	22.	3.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	25.	3.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	3.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	3.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	3.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	3.
20.	3.	1.	1.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	3.
20.	3.	1.	3.	5.	1.	2.	1.	4.	2.	1.	2.	3.	56.	3.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	3.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	3.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	33.	3.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	3.
20.	3.	2.	1.	5.	1.	1.	1.	4.	2.	2.	0	0	0	0
20.	3.	2.	3.	5.	1.	2.	1.	4.	2.	1.	0	0	0	0
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	0
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	0
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	0
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	0
20.	4.	1.	1.	5.	1.	1.	1.	4.	2.	1.	0	0	0	0
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	0
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	0
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	0
20.	4.	1.	3.	2.	1.	1.	1.	4.	2.	2.	0	0	0	0
20.	4.	1.	3.	2.	1.	1.	1.	4.	2.	1.	0	0	0	0
21.	1.	1.	1.	0	1.	2.	0	4.	0	1.	2.	8.	24.	8.
21.	2.	1.	1.	0	1.	2.	0	4.	0	1.	2.	13.	24.	13.
21.	3.	1.	1.	0	1.	2.	0	4.	0	1.	2.	5.	24.	5.
21.	4.	1.	1.	0	1.	2.	0	4.	0	0	2.	5.	20.	5.
21.	5.	1.	1.	0	1.	2.	0	4.	0	1.	2.	13.	24.	13.
22.	1.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0	0
22.	2.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0	0
22.	3.	1.	1.	0	0	2.	0	0	0	1.	0	0	0	0
22.	4.	1.	1.	0	0	2.	0	0	0	1.	0	0	0	0

TABLE F-6. (Continued)

Sampling Site Identification				Weighted Factor Scores										
Bldg.	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted. % Asbestos	Average % Asbestos	Exposure Score	% Total Mineral Fiber
22.	5.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0	0
23.	1.	1.	1.	0	1.	1.	1.	4.	0	0	0	0	0	0
23.	2.	1.	1.	5.	1.	1.	1.	4.	0	0	2.	3.	22.	3.
23.	3.	1.	1.	0	1.	1.	1.	4.	0	0	2.	8.	12.	8.
24.	1.	1.	1.	5.	1.	1.	0	4.	2.	1.	2.	15.	26.	25.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.	25.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.	25.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.	25.
24.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	15.	22.	25.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	15.	18.	25.
24.	1.	2.	1.	5.	1.	1.	0	4.	2.	1.	3.	60.	39.	60.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.	60.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.	60.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.	60.
24.	1.	2.	3.	2.	3.	1.	0	4.	0	2.	3.	60.	33.	60.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	2.	3.	60.	27.	60.
24.	2.	1.	1.	2.	1.	1.	0	4.	1.	2.	2.	30.	20.	30.
24.	2.	1.	3.	5.	1.	0	0	4.	0	1.	2.	30.	0	30.
24.	2.	1.	3.	5.	1.	1.	0	4.	0	1.	2.	30.	22.	30.
24.	2.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	30.	19.	30.
24.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	30.	32.	30.
24.	2.	1.	3.	5.	1.	0	0	4.	0	2.	2.	30.	0	30.
24.	3.	1.	1.	2.	1.	0	0	4.	0	2.	2.	30.	0	40.
24.	3.	1.	3.	5.	1.	0	0	4.	2.	0	2.	30.	0	40.
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.	40.
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.	40.
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.	40.
24.	3.	1.	3.	5.	1.	0	0	4.	2.	1.	2.	30.	0	40.
25.	1.	1.	1.	2.	3.	0	0	4.	0	1.	2.	15.	0	18.
25.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.	18.
25.	1.	1.	3.	2.	3.	1.	0	4.	0	1.	2.	15.	20.	18.
25.	1.	1.	3.	2.	3.	0	0	4.	0	2.	2.	15.	0	18.
25.	1.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	15.	28.	18.
25.	1.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	15.	18.	18.
25.	2.	1.	1.	2.	1.	0	0	4.	1.	1.	2.	20.	0	25.
25.	2.	1.	3.	2.	1.	2.	0	4.	0	1.	2.	20.	32.	25.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.	25.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.	25.
25.	2.	1.	3.	2.	1.	1.	0	4.	2.	2.	2.	20.	22.	25.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.	25.
26.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	2.	40.	52.	40.
27.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	3.	55.	70.	55.
28.	2.	1.	1.	2.	1.	2.	0	4.	0	1.	2.	18.	32.	83.
29.	1.	1.	1.	2.	1.	3.	0	4.	0	2.	3.	86.	81.	80.

TABLE F-7. AVERAGES PLOTTED IN FIGURE 9.

Sampling Site Identfctn			Averages	
Bldg.	Site	Sampling Location	Weighted Friablty	% Mineral Fiber
6.	1.	1.	2.00	30.
6.	2.	1.	1.00	5.
7.	1.	1.	1.00	8.
7.	2.	1.	0	5.
7.	3.	1.	1.00	8.
8.	1.	1.	2.50	75.
8.	2.	1.	2.00	30.
8.	3.	1.	.50	1.
8.	4.	1.	1.50	30.
8.	5.	1.	2.00	30.
8.	6.	1.	2.00	30.
9.	1.	1.	.50	10.
9.	2.	1.	.50	10.
9.	3.	1.	.50	10.
10.	1.	1.	2.00	70.
10.	2.	1.	2.00	70.
11.	1.	1.	2.50	45.
11.	2.	1.	2.50	50.
14.	1.	1.	2.50	90.
14.	2.	1.	2.50	90.
14.	3.	1.	2.50	85.
15.	1.	1.	2.67	75.
15.	1.	2.	2.67	86.
15.	3.	1.	2.67	50.
16.	1.	1.	1.33	8.
16.	2.	1.	1.17	15.
16.	2.	2.	1.17	13.
16.	3.	1.	1.17	20.
16.	4.	1.	1.00	15.
17.	1.	1.	2.17	0
17.	2.	1.	2.33	0
17.	3.	1.	2.17	0
18.	1.	1.	1.00	16.
18.	2.	1.	1.00	23.
19.	1.	1.	.83	8.
19.	2.	1.	1.00	28.
20.	1.	1.	1.17	0
20.	2.	1.	1.00	3.
20.	3.	1.	1.17	3.
20.	3.	2.	1.17	0
20.	4.	1.	1.00	0
21.	1.	1.	2.00	8.
21.	2.	1.	2.00	13.
21.	3.	1.	2.00	5.
21.	4.	1.	2.00	5.
21.	5.	1.	2.00	13.
22.	1.	1.	2.00	0
22.	2.	1.	2.00	0
22.	3.	1.	2.00	0
22.	4.	1.	2.00	0
22.	5.	1.	2.00	0
23.	1.	1.	1.00	0
23.	2.	1.	1.00	3.
23.	3.	1.	1.00	8.
24.	1.	1.	1.00	25.
24.	1.	2.	1.00	60.

TABLE F-7. (Continued)

Sampling Site Identifctn			Averages	
Bldg.	Site	Sampling Location	Weighted Friablty	% Mineral Fiber
24.	2.	1.	.67	30.
24.	3.	1.	.50	40.
25.	1.	1.	.67	10.
25.	2.	1.	1.00	25.
26.	1.	1.	2.00	40.
27.	1.	1.	2.00	55.
29.	2.	1.	2.50	83.
29.	1.	1.	3.00	80.

TABLES F-8. RAW DATA USED IN FIGURES 10, 11, 12

Sampling Site Identification				WEIGHTED FACTOR SCORES											
Bldg	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted % Asbestos	Average % Asbestos	Exposure Score	Score W/Out % Asbestos	Score W/Out % Asb. or Friability
6.	1.	1.	5.	5.	1.	2.	0	4.	2.	1.	2.	30.	52.	26.	13.
6.	2.	1.	5.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.	11.	11.
7.	1.	1.	5.	2.	1.	1.	0	4.	1.	2.	2.	8.	20.	10.	10.
7.	2.	1.	5.	2.	1.	0	0	4.	1.	1.	2.	5.	0	0	9.
7.	3.	1.	5.	2.	1.	1.	0	4.	1.	1.	2.	8.	18.	9.	9.
8.	1.	1.	5.	5.	1.	2.	0	4.	2.	2.	3.	75.	84.	28.	14.
8.	1.	1.	5.	5.	3.	3.	0	4.	2.	2.	3.	75.	144.	48.	16.
8.	2.	1.	5.	5.	1.	2.	0	4.	0	1.	2.	30.	44.	22.	11.
8.	2.	1.	5.	2.	1.	2.	0	4.	1.	0	2.	30.	32.	16.	8.
8.	3.	1.	5.	0	1.	0	0	4.	0	1.	0	1.	0	0	6.
8.	3.	1.	5.	0	1.	1.	0	4.	0	0	0	1.	0	5.	5.
8.	4.	1.	5.	2.	1.	1.	0	4.	0	1.	2.	30.	16.	8.	8.
8.	4.	1.	5.	2.	1.	2.	0	4.	1.	1.	2.	30.	36.	18.	9.
8.	5.	1.	5.	5.	1.	2.	0	4.	2.	2.	2.	30.	56.	28.	14.
8.	5.	1.	5.	5.	1.	2.	0	1.	2.	2.	2.	30.	44.	22.	11.
8.	6.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	30.	32.	16.	8.
8.	6.	1.	5.	2.	1.	2.	0	4.	1.	2.	2.	30.	46.	23.	10.
9.	1.	1.	5.	2.	1.	0	0	4.	0	0	2.	10.	0	0	7.
9.	1.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	8.	8.
9.	2.	1.	5.	0	1.	0	0	4.	0	1.	2.	10.	0	0	6.
9.	2.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	8.	8.
9.	3.	1.	5.	2.	1.	1.	0	4.	1.	0	2.	10.	16.	8.	8.
9.	3.	1.	5.	2.	1.	0	0	4.	1.	0	2.	10.	0	0	8.
10.	1.	1.	5.	2.	1.	2.	0	4.	0	0	3.	70.	42.	14.	7.
10.	1.	1.	5.	2.	3.	2.	0	4.	0	0	3.	70.	54.	18.	9.
10.	2.	1.	5.	2.	1.	2.	0	4.	0	1.	3.	70.	48.	16.	8.
10.	2.	1.	5.	2.	1.	2.	0	4.	0	2.	3.	70.	54.	18.	9.
11.	1.	1.	5.	2.	1.	2.	0	4.	0	1.	2.	45.	32.	16.	8.
11.	1.	1.	5.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	33.	11.
11.	2.	1.	5.	5.	3.	2.	1.	4.	0	2.	2.	50.	60.	30.	15.
11.	2.	1.	5.	5.	1.	3.	1.	4.	0	2.	2.	50.	78.	39.	13.
14.	1.	1.	1.	2.	1.	2.	0	4.	0	1.	3.	60.	48.	16.	8.
14.	1.	1.	3.	2.	1.	2.	0	4.	0	1.	3.	60.	48.	16.	8.
14.	1.	1.	3.	5.	1.	2.	0	4.	0	1.	3.	60.	66.	22.	11.
14.	1.	1.	3.	5.	1.	3.	0	4.	0	2.	3.	60.	108.	36.	12.
14.	1.	1.	3.	2.	1.	3.	0	4.	0	2.	3.	60.	81.	27.	9.
14.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	3.	60.	99.	33.	11.
14.	2.	1.	1.	2.	0	2.	0	4.	0	0	3.	55.	36.	12.	6.
14.	2.	1.	3.	2.	1.	2.	0	4.	0	1.	3.	55.	48.	16.	8.
14.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	3.	55.	72.	24.	12.
14.	2.	1.	3.	2.	1.	3.	0	4.	0	1.	3.	55.	72.	24.	8.
14.	2.	1.	3.	5.	1.	3.	0	4.	0	1.	3.	55.	99.	33.	11.
14.	2.	1.	3.	5.	1.	3.	0	4.	1.	1.	3.	55.	108.	36.	12.
14.	3.	1.	1.	2.	1.	2.	0	4.	0	0	2.	45.	28.	14.	7.
14.	3.	1.	3.	5.	1.	2.	0	4.	2.	1.	2.	45.	52.	26.	13.
14.	3.	1.	3.	5.	1.	2.	0	4.	1.	1.	2.	45.	48.	24.	12.
14.	3.	1.	3.	2.	1.	3.	0	4.	2.	2.	2.	45.	66.	33.	11.
14.	3.	1.	3.	5.	1.	3.	0	4.	2.	1.	2.	45.	78.	39.	13.
14.	3.	1.	3.	5.	1.	3.	0	4.	1.	1.	2.	45.	72.	36.	12.
15.	1.	1.	1.	5.	1.	2.	0	4.	1.	1.	2.	45.	48.	24.	12.
15.	1.	1.	3.	5.	3.	2.	0	4.	0	2.	2.	45.	56.	28.	14.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	33.	11.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	2.	2.	45.	72.	36.	12.
15.	1.	1.	3.	5.	3.	3.	0	4.	0	2.	2.	45.	84.	42.	14.
15.	1.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	45.	66.	33.	11.
15.	1.	2.	1.	5.	1.	2.	0	4.	1.	1.	3.	85.	72.	24.	12.

TABLE F-8. (Continued)

Sampling Site Identification			Type of Mater	WEIGHTED FACTOR SCORES							Wghted % Asbestos	Average % Asbestos	Exposure Score	Score W/Out % Asbestos	Score W/Out % Asb. or Friability
Bldg	Site	Sampling Location		Condition	Access	Friability	Air	Expose	Water	Activity					
15.	1.	2.	3.	5.	3.	2.	0	4.	0	2.	3.	85.	84.	28.	14.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	1.	3.	85.	99.	33.	11.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	2.	3.	85.	108.	36.	12.
15.	1.	2.	3.	5.	3.	3.	0	4.	0	2.	3.	85.	126.	42.	14.
15.	1.	2.	3.	5.	1.	3.	0	4.	0	1.	3.	85.	99.	33.	11.
15.	3.	1.	1.	5.	1.	2.	0	4.	0	0	2.	33.	40.	20.	10.
15.	3.	1.	3.	5.	1.	2.	0	4.	0	0	2.	33.	40.	20.	10.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	1.	2.	33.	66.	33.	11.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	0	2.	33.	60.	33.	10.
15.	3.	1.	3.	5.	3.	3.	0	4.	0	0	2.	33.	72.	36.	12.
15.	3.	1.	3.	5.	1.	3.	0	4.	0	0	2.	33.	60.	30.	10.
16.	1.	1.	1.	2.	1.	1.	0	4.	0	2.	2.	8.	18.	9.	9.
16.	1.	1.	3.	2	1.	1.	0	4.	0	1.	2.	8.	12.	6.	6.
16.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	8.	16.	8.	8.
16.	1.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	8.	18.	9.	9.
16.	1.	1.	3.	2.	1.	2.	0	4.	0	2.	2.	8.	36.	18.	9.
16.	1.	1.	3.	2.	1.	2.	0	4.	2.	1.	2.	8.	46.	20.	10.
16.	2.	1.	1.	5.	1.	1.	0	4.	2.	1.	2.	10.	26.	13.	13.
16.	2.	1.	3.	2.	3.	1.	0	4.	2.	2.	2.	10.	26.	13.	13.
16.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	10.	32.	16.	16.
16.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	10.	32.	16.	16.
16.	2.	1.	3.	5.	3.	2.	0	4.	2.	2.	2.	10.	64.	32.	16.
16.	2.	1.	3.	5.	1.	1.	0	4.	2.	2.	2.	10.	28.	14.	14.
16.	2.	2.	1.	5.	1.	1.	0	4.	2.	1.	2.	3.	26.	13.	13.
16.	2.	2.	3.	2.	3.	1.	0	4.	2.	2.	2.	3.	26.	13.	13.
16.	2.	2.	3.	5.	3.	1.	0	4.	2.	2.	2.	3.	32.	16.	16.
16.	2.	2.	3.	5.	3.	1.	0	4.	2.	2.	2.	3.	32.	16.	16.
16.	2.	2.	3.	5.	3.	2.	0	4.	2.	2.	2.	3.	64.	32.	16.
16.	2.	2.	3.	5.	1.	1.	0	4.	2.	2.	2.	3.	28.	14.	14.
16.	3.	1.	1.	2.	1.	1.	0	4.	0	1.	2.	16.	16.	8.	8.
16.	3.	1.	3.	2.	1.	2.	0	4.	0	1.	2.	10.	32.	16.	8.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	10.	16.	8.	8.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	7.	7.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	7.	7.
16.	3.	1.	3.	2.	1.	1.	0	4.	0	0	2.	10.	14.	7.	7.
16.	4.	1.	1.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.	11.	11.
16.	4.	1.	3.	5.	1.	1.	0	4.	1.	1.	2.	5.	24.	12.	12.
16.	4.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	5.	18.	9.	9.
16.	4.	1.	3.	2.	1.	1.	0	4.	1.	2.	2.	5.	23.	10.	10.
16.	4.	1.	3.	2.	1.	1.	0	4.	2.	2.	2.	5.	22.	11.	11.
16.	4.	1.	3.	2.	1.	1.	0	4.	2.	1.	2.	5.	20.	10.	10.
17.	1.	1.	1.	5.	1.	2.	0	4.	2.	1.	0	0	0	26.	13.
17.	1.	1.	3.	5.	1.	3.	0	4.	2.	1.	0	0	0	39.	13.
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	26.	13.
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	26.	13.
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	26.	13.
17.	1.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	26.	13.
17.	2.	1.	1.	5.	1.	2.	0	4.	1.	1.	0	0	0	24.	12.
17.	2.	1.	3.	5.	3.	3.	0	4.	2.	1.	0	0	0	45.	15.
17.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	0	0	0	24.	12.
17.	2.	1.	3.	5.	1.	2.	0	4.	2.	1.	0	0	0	26.	13.
17.	2.	1.	3.	5.	1.	3.	0	4.	2.	2.	0	0	0	42.	14.
17.	2.	1.	3.	5.	1.	2.	0	4.	1.	1.	0	0	0	24.	12.
17.	3.	1.	1.	5.	3.	2.	0	4.	0	1.	0	0	0	26.	13.
17.	3.	1.	3.	5.	3.	3.	0	4.	0	2.	0	0	0	42.	14.
17.	3.	1.	3.	5.	3.	2.	0	4.	0	2.	0	0	0	28.	14.

TABLE F-8. (Continued)

Sampling Site Identification				WEIGHTED FACTOR SCORES											
Bldg	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted % Asbestos	Average % Asbestos	Exposure Score	Score W/Out % Asbestos	Score W/Out % Asb. or Friability
17.	3.	1.	3.	5.	1.	2.	0	4.	0	2.	0	0	0	24.	12.
17.	3.	1.	3.	9.	3.	2.	0	4.	0	2.	0	0	0	28.	14.
17.	3.	1.	3.	9.	1.	2.	0	4.	0	1.	0	0	0	22.	11.
18.	1.	1.	1.	5.	3.	1.	0	4.	0	2.	2.	13.	28.	14.	14.
18.	2.	1.	1.	2.	1.	1.	0	4.	2.	1.	2.	15.	20.	10.	10.
19.	1.	1.	1.	0	3.	1.	0	4.	0	2.	2.	8.	15.	9.	9.
19.	1.	1.	3.	2.	3.	0	0	4.	0	2.	2.	8.	0	0	11.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	11.	11.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	11.	11.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	11.	11.
19.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	8.	22.	11.	11.
19.	2.	1.	1.	2.	3.	1.	1.	4.	0	2.	2.	25.	24.	12.	12.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	25.	28.	14.	14.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	25.	28.	14.	14.
19.	2.	1.	3.	2.	3.	1.	0	4.	0	1.	2.	25.	20.	10.	10.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	1.	2.	25.	26.	13.	13.
19.	2.	1.	3.	5.	3.	1.	0	4.	0	1.	2.	25.	26.	13.	13.
20.	1.	1.	1.	5.	1.	1.	1.	4.	2.	2.	0	0	0	15.	15.
20.	1.	1.	3.	5.	1.	2.	1.	4.	2.	2.	0	0	0	30.	15.
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	15.	15.
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	15.	15.
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	14.	14.
20.	1.	1.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	15.	15.
20.	2.	1.	1.	2.	1.	1.	1.	4.	2.	1.	2.	3.	22.	11.	11.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	14.	14.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	14.	14.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	14.	14.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	15.	15.
20.	2.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	14.	14.
20.	3.	1.	1.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	15.	15.
20.	3.	1.	3.	5.	1.	2.	1.	4.	2.	1.	2.	3.	56.	28.	14.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	15.	15.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	14.	14.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	2.	2.	3.	30.	15.	15.
20.	3.	1.	3.	5.	1.	1.	1.	4.	2.	1.	2.	3.	28.	14.	14.
20.	3.	2.	1.	5.	1.	1.	1.	4.	2.	2.	0	0	0	15.	15.
20.	3.	2.	3.	5.	1.	2.	1.	4.	2.	1.	0	0	0	28.	14.
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	15.	15.
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	14.	14.
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	2.	0	0	0	15.	15.
20.	3.	2.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	14.	14.
20.	4.	1.	1.	5.	1.	1.	1.	4.	2.	1.	0	0	0	14.	14.
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	14.	14.
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	14.	14.
20.	4.	1.	3.	5.	1.	1.	1.	4.	2.	1.	0	0	0	14.	14.
20.	4.	1.	3.	2.	1.	1.	1.	4.	2.	2.	0	0	0	12.	12.
20.	4.	1.	3.	2.	1.	1.	1.	4.	2.	1.	0	0	0	11.	11.
21.	1.	1.	1.	0	1.	2.	0	4.	0	1.	2.	8.	24.	12.	6.
21.	2.	1.	1.	0	1.	2.	0	4.	0	1.	2.	13.	24.	12.	6.
21.	3.	1.	1.	0	1.	2.	0	4.	0	1.	2.	5.	24.	12.	6.
21.	4.	1.	1.	0	1.	2.	0	4.	0	0	2.	5.	20.	10.	5.
21.	5.	1.	1.	0	1.	2.	0	4.	0	1.	2.	13.	24.	12.	6.
22.	1.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0	4.	2.
22.	2.	1.	1.	0	0	2.	1.	0	0	1.	0	0	0	4.	2.
22.	3.	1.	1.	0	0	2.	0	0	0	1.	0	0	0	2.	1.
22.	4.	1.	1.	0	0	2.	0	0	0	1.	0	0	0	2.	1.

TABLE F-8. (Continued)

Sampling Site Identification				WEIGHTED FACTOR SCORES											
Bldg	Site	Sampling Location	Type of Rater	Condition	Access	Friability	Air	Expose	Water	Activity	Wghted % Asbestos	Average % Asbestos	Exposure Score	Score W/Out % Asbestos	Score W/Out % Asb. or Friability
22.	5.	1.	1.	0	0	2.	1.	0	0	1.	0	6	0	4.	2.
23.	1.	1.	1.	0	1.	1.	1.	4.	0	0	0	0	0	6.	6.
23.	2.	1.	1.	5.	1.	1.	1.	4.	0	0	2.	3.	22.	11.	11.
23.	3.	1.	1.	0	1.	1.	1.	4.	0	0	2.	8.	12.	6.	6.
24.	1.	1.	1.	5.	1.	1.	0	4.	2.	1.	2.	15.	26.	13.	13.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.	8.	8.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.	8.	8.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.	8.	8.
24.	1.	1.	3.	2.	3.	1.	0	4.	0	2.	2.	15.	22.	11.	11.
24.	1.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	15.	18.	9.	9.
24.	1.	2.	1.	5.	1.	1.	0	4.	2.	1.	3.	60.	39.	13.	13.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.	8.	8.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.	8.	8.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	1.	3.	60.	24.	8.	8.
24.	1.	2.	3.	2.	3.	1.	0	4.	0	2.	3.	60.	33.	11.	11.
24.	1.	2.	3.	2.	1.	1.	0	4.	0	2.	3.	60.	27.	9.	9.
24.	2.	1.	1.	2.	1.	1.	0	4.	1.	2.	2.	30.	20.	10.	10.
24.	2.	1.	3.	5.	1.	0	0	4.	0	1.	2.	30.	0	0	11.
24.	2.	1.	3.	5.	1.	1.	0	4.	0	1.	2.	30.	22.	11.	11.
24.	2.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	30.	18.	9.	9.
24.	2.	1.	3.	5.	3.	1.	0	4.	2.	2.	2.	30.	32.	16.	16.
24.	2.	1.	3.	5.	1.	0	0	4.	0	2.	2.	30.	0	0	12.
24.	3.	1.	1.	2.	1.	0	0	4.	0	2.	2.	30.	0	0	9.
24.	3.	1.	3.	5.	1.	0	0	4.	2.	0	2.	30.	0	0	12.
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.	13.	13.
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.	13.	13.
24.	3.	1.	3.	5.	1.	1.	0	4.	2.	1.	2.	30.	26.	13.	13.
24.	3.	1.	3.	5.	1.	0	0	4.	2.	1.	2.	30.	0	0	13.
25.	1.	1.	1.	2.	3.	0	0	4.	0	1.	2.	15.	0	0	10.
25.	1.	1.	3.	2.	1.	1.	0	4.	0	1.	2.	15.	16.	8.	8.
25.	1.	1.	3.	2.	3.	1.	0	4.	0	1.	2.	15.	20.	10.	10.
25.	1.	1.	3.	2.	3.	6	0	4.	0	2.	2.	15.	0	0	11.
25.	1.	1.	3.	5.	3.	1.	0	4.	0	2.	2.	15.	28.	14.	14.
25.	1.	1.	3.	2.	1.	1.	0	4.	0	2.	2.	15.	19.	9.	9.
25.	2.	1.	1.	2.	1.	0	0	4.	1.	1.	2.	20.	0	0	9.
25.	2.	1.	3.	2.	1.	2.	0	4.	0	1.	2.	26.	32.	16.	8.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.	9.	9.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.	9.	9.
25.	2.	1.	3.	2.	1.	1.	0	4.	2.	2.	2.	20.	22.	11.	11.
25.	2.	1.	3.	2.	1.	1.	0	4.	1.	1.	2.	20.	18.	9.	9.
26.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	2.	40.	52.	26.	13.
27.	1.	1.	1.	5.	1.	2.	1.	4.	0	2.	3.	55.	78.	26.	13.
28.	2.	1.	1.	2.	1.	2.	0	4.	0	1.	2.	18.	32.	16.	8.
29.	1.	1.	1.	2.	1.	3.	0	4.	0	2.	3.	86.	81.	27.	9.

TABLE F-9. AVERAGES PLOTTED IN FIGURE 10.

Sampling Site Identificatn			Averages	
Bldg.	Site	Sampling Location	Exposure Score	% Asbestos
6.	1.	1.	52.	30.
6.	2.	1.	22.	5.
7.	1.	1.	20.	8.
7.	2.	1.	0	5.
7.	3.	1.	19.	8.
8.	1.	1.	114.	75.
8.	2.	1.	39.	30.
8.	3.	1.	0	1.
8.	4.	1.	26.	30.
8.	5.	1.	51.	30.
8.	6.	1.	36.	30.
9.	1.	1.	8.	10.
9.	2.	1.	8.	10.
9.	3.	1.	8.	10.
10.	1.	1.	48.	70.
10.	2.	1.	51.	70.
11.	1.	1.	43.	45.
11.	2.	1.	69.	50.
14.	1.	1.	75.	60.
14.	2.	1.	73.	55.
14.	3.	1.	57.	45.
15.	1.	1.	65.	45.
15.	1.	2.	98.	85.
15.	3.	1.	56.	33.
16.	1.	1.	23.	8.
16.	2.	1.	35.	10.
16.	2.	2.	35.	3.
16.	3.	1.	18.	10.
16.	4.	1.	21.	5.
17.	1.	1.	0	0
17.	2.	1.	0	0
17.	3.	1.	0	0
18.	1.	1.	28.	13.
18.	2.	1.	20.	15.
19.	1.	1.	18.	8.
19.	2.	1.	25.	25.
20.	1.	1.	0	0
20.	2.	1.	27.	3.
20.	3.	1.	34.	3.
20.	3.	2.	0	0
20.	4.	1.	0	0
21.	1.	1.	24.	8.
21.	2.	1.	24.	13.
21.	3.	1.	24.	5.
21.	4.	1.	20.	5.
21.	5.	1.	24.	13.
22.	1.	1.	0	0
22.	2.	1.	0	0
22.	3.	1.	0	0
22.	4.	1.	0	0
22.	5.	1.	0	0
23.	1.	1.	0	0
23.	2.	1.	22.	3.
23.	3.	1.	12.	8.
24.	1.	1.	19.	15.
24.	1.	2.	29.	60.

TABLE F-9. (Continued)

Sampling Site Identifictn			Averages	
Bldg.	Site	Sampling Location	Exposure Score	% Asbestos
24.	2.	1.	15.	30.
24.	3.	1.	13.	30.
25.	1.	1.	14.	15.
25.	2.	1.	18.	20.
26.	1.	1.	52.	40.
27.	1.	1.	73.	55.
28.	2.	1.	32.	19.
29.	1.	1.	81.	80.

TABLE F-10. AVERAGES PLOTTED IN FIGURE 11.

Sampling Site Identifctn			Averages	
Bldg.	Site	Sampling Location	Score W/out % Asbestos	% Asbestos
6.	1.	1.	26.	30.
6.	2.	1.	11.	5.
7.	1.	1.	13.	8.
7.	2.	1.	0	5.
7.	3.	1.	9.	8.
8.	1.	1.	38.	75.
8.	2.	1.	19.	30.
8.	3.	1.	3.	1.
8.	4.	1.	13.	30.
8.	5.	1.	25.	30.
8.	6.	1.	19.	30.
9.	1.	1.	4.	10.
9.	2.	1.	4.	10.
9.	3.	1.	4.	10.
10.	1.	1.	16.	70.
10.	2.	1.	17.	70.
11.	1.	1.	25.	45.
11.	2.	1.	35.	50.
14.	1.	1.	25.	60.
14.	2.	1.	24.	55.
14.	3.	1.	29.	45.
15.	1.	1.	33.	45.
15.	1.	2.	33.	85.
15.	3.	1.	28.	33.
16.	1.	1.	12.	8.
16.	2.	1.	17.	10.
16.	2.	2.	17.	3.
16.	3.	1.	9.	10.
16.	4.	1.	11.	5.
17.	1.	1.	28.	0
17.	2.	1.	31.	0
17.	3.	1.	28.	0
18.	1.	1.	14.	13.
18.	2.	1.	13.	15.
19.	1.	1.	9.	8.
19.	2.	1.	13.	25.
20.	1.	1.	17.	0
20.	2.	1.	14.	3.
20.	3.	1.	17.	3.
20.	3.	2.	17.	0
20.	4.	1.	13.	0
21.	1.	1.	12.	8.
21.	2.	1.	12.	13.
21.	3.	1.	12.	5.
21.	4.	1.	10.	5.
21.	5.	1.	12.	13.
22.	1.	1.	4.	0
22.	2.	1.	4.	0
22.	3.	1.	2.	0
22.	4.	1.	2.	0
22.	5.	1.	4.	0
23.	1.	1.	6.	0
23.	2.	1.	11.	3.
23.	3.	1.	6.	8.
24.	1.	1.	10.	15.
24.	1.	2.	10.	60.

TABLE F-10. (Continued)

Sampling Site Identiftn			Averages	
Bldg.	Site	Sampling Location	Score W/out % Asbestos	% Asbestos
24.	2.	1.	8.	30.
24.	3.	1.	7.	30.
25.	1.	1.	7.	15.
25.	2.	1.	9.	20.
26.	1.	1.	26.	40.
27.	1.	1.	26.	55.
2d.	2.	1.	16.	18.
29.	1.	1.	27.	80.

TABLE F-11. AVERAGES PLOTTED IN FIGURE 12.

Sampling Site Identification			Averages	
Bldg.	Site	Sampling Location	Score W/Out % Asbestos or Friability	% of Asbestos
6.	1.	1.	13.	30.
6.	2.	1.	11.	5.
7.	1.	1.	10.	8.
7.	2.	1.	9.	5.
7.	3.	1.	9.	8.
8.	1.	1.	15.	75.
8.	2.	1.	10.	30.
8.	3.	1.	6.	1.
8.	4.	1.	9.	30.
8.	5.	1.	13.	30.
8.	6.	1.	9.	30.
9.	1.	1.	8.	10.
9.	2.	1.	7.	10.
9.	3.	1.	8.	10.
10.	1.	1.	8.	70.
10.	2.	1.	9.	70.
11.	1.	1.	10.	45.
11.	2.	1.	14.	50.
14.	1.	1.	10.	60.
14.	2.	1.	10.	55.
14.	3.	1.	11.	45.
15.	1.	1.	12.	45.
15.	1.	2.	12.	85.
15.	3.	1.	11.	33.
16.	1.	1.	9.	8.
16.	2.	1.	15.	10.
16.	2.	2.	15.	3.
16.	3.	1.	8.	10.
16.	4.	1.	11.	5.
17.	1.	1.	13.	0
17.	2.	1.	13.	0
17.	3.	1.	13.	0
18.	1.	1.	14.	13.
18.	2.	1.	10.	15.
19.	1.	1.	11.	8.
19.	2.	1.	13.	25.
20.	1.	1.	15.	0
20.	2.	1.	14.	3.
20.	3.	1.	15.	3.
20.	3.	2.	15.	0
20.	4.	1.	13.	0
21.	1.	1.	6.	8.
21.	2.	1.	6.	13.
21.	3.	1.	6.	5.
21.	4.	1.	5.	5.
21.	5.	1.	6.	13.
22.	1.	1.	2.	0
22.	2.	1.	2.	0
22.	3.	1.	1.	0
22.	4.	1.	1.	0
22.	5.	1.	2.	0
23.	1.	1.	6.	0
23.	2.	1.	11.	3.
23.	3.	1.	6.	8.
24.	1.	1.	10.	15.

TABLE F-11. (Continued)

Sampling Site Identification			Averages	
Bldg.	Site	Sampling Location	Score W/Out % Asbestos or Friability	% of Asbestos
24.	2.	1.	12.	30.
24.	3.	1.	12.	30.
25.	1.	1.	10.	15.
25.	2.	1.	9.	20.
26.	1.	1.	13.	40.
27.	1.	1.	13.	55.
28.	2.	1.	8.	18.
29.	1.	1.	9.	80.